The Refrigeration Service Engineer

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No. 12

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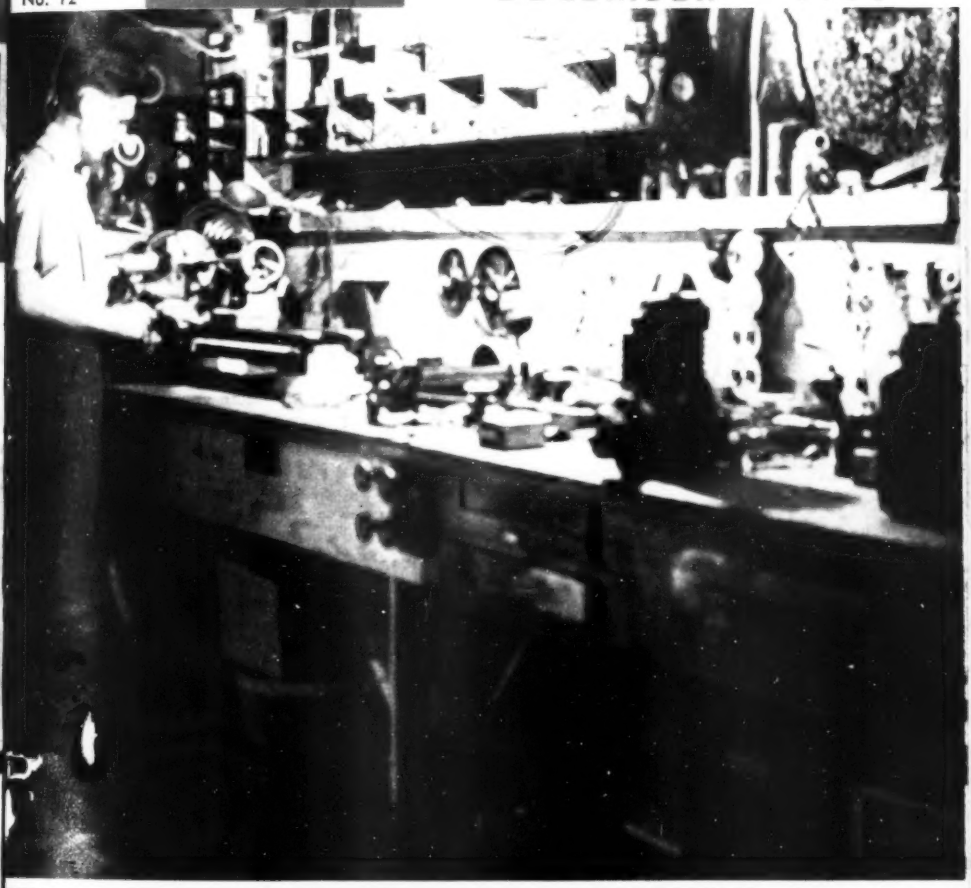

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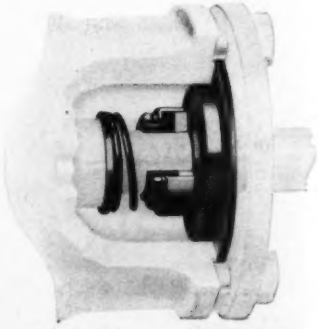

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January to December, 1936 — **Volume Four**

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The REFRIGERATION SERVICE ENGINEER

Devoted to the Servicing of

REFRIGERATION UNITS *and* OIL BURNERS

VOL. 4 DECEMBER, 1936 No. 12

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OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 4, No. 12 CHICAGO, DECEMBER, 1936 $2.00 per Annum

Electronics for Servicemen

The first of a series of articles on elementary electrical circuits and the basic methods of electrical control

By WALTER G. CHRISTIE, B.S.E.E

EVERY year the refrigerator and oil burner manufacturers are using more complicated electrical circuits. This is especially true in the case of air conditioning apparatus. Manufacturers find that a cheaper, simpler and more efficient machine can be made by substituting electrically operated controls for manually operated ones. Hence, the service man of today must be able to diagnose correctly electrical ailments in these machines.

In order to do this, the serviceman must have a basic knowledge of electrical circuits, and must know the definition of the various common terms used in electricity. The purpose of this series of articles is to lay the foundation, or groundwork, for discussions of the many complicated, and yet, common electrical circuits used today in refrigeration and air conditioning.

This first article will start off with an explanation of the various terms used in the electrical circuit, and will lead up to the analysis of simple electrical service troubles.

Definitions

The electrical circuit can readily be compared with a plumbing circuit. Consider the plumbing circuit in Fig. 1. If the air pump runs so as to keep a constant pressure on the water in the tank, water will flow into the pail at a certain rate. Suppose that the pressure is maintained at 10 lbs. per square inch, and that water flows into the pail at the rate of one lb. per second. This will continue at the same rate until the tank is empty, provided the pressure is maintained at 10 lbs. per square inch.

Now, if the pressure is reduced to 5 lbs. per square inch, what will happen to the rate at which water enters the pail?

It will be cut in half, because only half as much pressure is driving the water out of the tank. Likewise, if the pressure is increased to 20 lbs. per square inch, 2 lbs. of water will enter the pail each second. The point is this: the rate of flow depends directly on the pressure difference between the tank and the pail (*the* pail is open and hence there is zero pounds of pressure on the pail); the greater the difference, the greater the flow.

However, the difference in the pressure is not the only factor which affects the rate of flow. The size of the pipe is also a factor. A pressure difference of 10 lbs. on a 1 inch

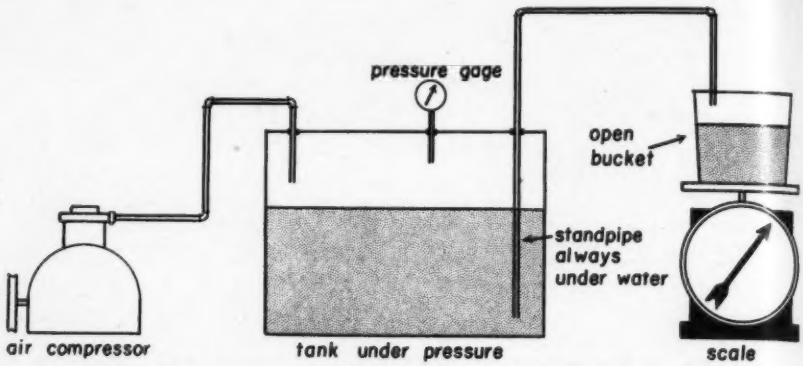


FIG. 1. COMPARISON OF PLUMBING CIRCUIT TO ELECTRICAL CIRCUIT.

Compressor maintains constant pressure in tank and water flows into bucket at a constant rate. Increase in pressure causes increase in rate of flow.

pipe might give a rate of flow of 1 lb. of water per second. But a pipe of 1/10 of an inch in diameter would give about 1/100 lb. of water per second. The smaller pipe offers more resistance to the flow of water than does the larger pipe. Hence, we see that *the resistance of the circuit affects the rate of flow through the circuit.*

Application to Electrical Circuits

Now, consider the electrical circuit in Fig. 2.

Across the terminals of the generator we have an electrical pressure which is measured in *volts.* (In the water circuit it is measured in pounds per square inch.) Through the wires of the circuit an electrical current passes. This is measured in *amperes.* (In the water circuit it is measured in pounds per second.) The resistance of the circuit is measured in *ohms.*

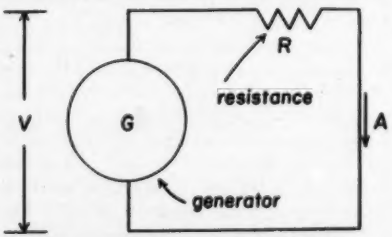


FIG. 2. SIMPLE ELECTRIC CIRCUIT.

Voltage set up across generator causes a current to flow through the resistance.

Increase in voltage causes *increase* in current.

Increase in resistance causes *decrease* in current.

Now, in the water circuit we saw that two factors affected the rate of flow of water through the circuit:

1. **The pressure difference.**
2. **The resistance.**

The same factors affect the flow of current in the electrical circuit, namely:

1. **Voltage.**
2. **Resistance.**

Ohm's Law

The relationship between voltage, current and resistance can be set up in an equation which is known as Ohm's law. This is:

$$V = (A)\,(R)$$

$$A = \frac{V}{R}$$

$$R = \frac{V}{A}$$

or, voltage is equal to current in amperes, multiplied by resistance in ohms.

To make this clear, let us apply Ohm's law to the simple electric circuit in Fig. 3. We know the voltage and the resistance and we

want to find the current flowing in the circuit. We apply Ohm's law:

$$V = (A)\ (R)$$
$$100 = (A)\ (10)$$
$$A = \frac{100}{10}$$
$$A = 10 \text{ amperes}$$

We now know the definition of three common terms:

1. **Volt is the unit of electrical pressure.**
2. **Ampere is the unit of electrical current.**
3. **Ohm is the unit of electrical resistance.**

We know the relationship existing between voltage, current and resistance:

$$V = (A)\ (R)$$
$$A = \frac{V}{R}$$
$$R = \frac{V}{A}$$

Now let us go back to the water circuit to get our definition of power.

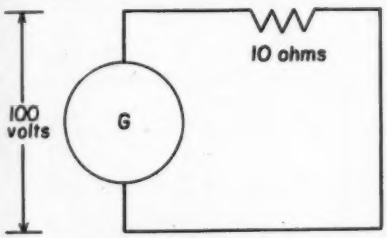


FIG. 3. ILLUSTRATION OF OHM'S LAW.

Ohm's Law:

$$A = \frac{V}{R}$$

or

$$V = AR \text{ or } R = \frac{V}{A}$$

$$A = \frac{100}{10} = 10 \text{ amperes}$$

Power

The pump creates a pressure on the water. This pressure forces the water out of the tank. The work done in the circuit is the moving of the water through the pipe against the resistance of the pipe. The pressure does not do this work; rather it is the *power supplied by the pump that does the work.* The pressure is *just the method by which this is accomplished.* The power supplied by the air pump is lost in the circuit when the water runs through the pipe. This power loss depends on two factors:

1. **The pressure in the circuit.**
2. **The rate of flow through the pipe.**

Thus, we can say that the power in the water circuit is proportional to the pressure, and to the rate of flow of water through the circuit:

Power = (pressure) (flow)

The same holds true in the electrical circuit. The power to drive the current through the circuit is supplied by the engine driving the generator. This power is lost in the circuit when current flows through the circuit. The work done in the circuit as a result of this power is evidenced by the resistance getting hot.

As in the water circuit, the power lost in the circuit is proportional to the rate of flow of current and to the pressure. This power can be figured by the following equation:

Power = (volts) (amperes)

But we found from Ohm's law that:

volts = (amperes) (resistance)

Hence we can write:

Power = (amperes) (resistance) (amperes)

or as the engineers would write:

$$P = A^2 R$$

From Ohm's law we found:

$$\text{Amperes} = \frac{\text{volts}}{\text{resistance}}$$

Hence we can write:

$$\text{Power} = (\text{volts}) \frac{\text{volts}}{(\text{resistance})}$$

or

$$\text{Power} = \frac{V^2}{R}$$

We now have three means of finding the power in an electrical circuit:

1. $P = (V)\ (A)$
2. $P = A^2 R$
3. $P = \frac{V^2}{R}$

Let's apply these equations to several simple circuits in order to see how they work.

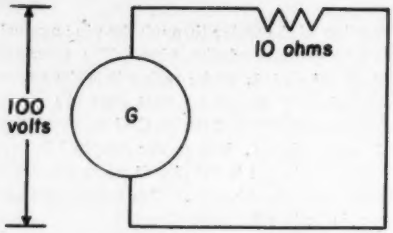


FIG. 4.
EQUATIONS FOR DETERMINING POWER.

Power: $P = VA$

By Ohm's Law:

$$V = AR$$

$$P = (AR)\ (A) = A^2R$$

$$A = \frac{V}{R}$$

$$P = (V)\ \left(\frac{V}{R}\right) = \frac{V^2}{R}$$

$$P = \frac{V^2}{R} = \frac{(100)\ (100)}{10} =$$

1000 Watts

$$P = VA = (100)\ (10) =$$

1000 Watts

$$P = A^2R = (10)\ (10)\ (10)$$

$$= 100 \text{ Watts}$$

In Fig. 4, the power can be found by several different methods. The easiest is by using equation number 8:

$$P = \frac{V^2}{R}$$

$$P = \frac{(100)\ (100)}{10} = \frac{1000}{10} = 1000 \text{ watts}$$

By equation number 1:

First apply Ohm's law to find the current:

$$V = AR$$

$$A = \frac{V}{R} = \frac{100}{10} = 10 \text{ amperes}$$

$$P = (V)\ (A) = (100)\ (10) = 1000 \text{ watts}$$

By equation number 2:

$$P = A^2R$$

$$P = (10)\ (10)\ (10) = 1000 \text{ watts}$$

A watt is the unit of electrical pressure. We now have three methods of finding power.

We now know four definitions:

1. A volt is the unit of electrical pressure.
2. An ampere is the unit of electrical current.
3. An ohm is the unit of electrical resistance.
4. A watt is the unit of electrical power.

Let us consider a common service problem, that of low voltage. Low voltage may be caused by a poor voltage supply, or by too small a feeder wire, or by a bad connection.

Fig. 5 shows a typical circuit.

If a test lamp is placed across the motor leads, the lamp will glow dimly; whereas if the lamp is connected across the line, the lamp will glow normally.

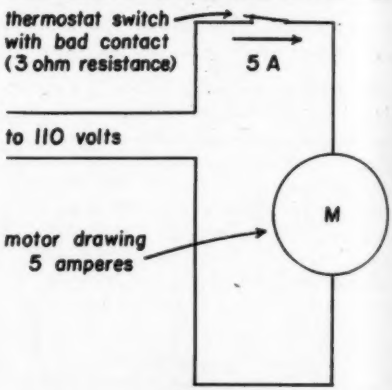


FIG. 5.
POWER AND VOLTAGE LOSS EQUATIONS.

Voltage drop across switch:

$$V = AR = (5)\ (3) = 15 \text{ Volts}$$

Voltage across motor:

$$V_M = V_{LINE} - V_{SWITCH} =$$

$$110 - 15 = 95 \text{ Volts}$$

Power lost in switch:

$$P = A^2R = (5)\ (5)\ (3) =$$

75 Watts

Power lost in motor:

$$P = \frac{V^2}{R} = \frac{(95)\ (95)}{5} =$$

1815 Watts

Let's find out the power lost in the switch. This will be:

$$P = A^2 R$$
$$P = (5)\ (5)\ (3) = 75 \text{ watts}$$

This power loss in the switch will show up as heat in the switch.

As a result of this power loss, the motor will not receive sufficient power to handle the load imposed on it by the compressor. As a result, the motor will tend to run on its brushes, if it is of the repulsion type. It will stall and hum if it is of the capacitor type. In either case the motor will burn out in several hours if the condition of low voltage is not corrected.

The principle that power loss in a resistor results in heat is used in time delay fuses, and in circuit breakers to protect motors from overload.

In time delay fuses, an ordinary fuse link is soldered to a small resistor. The fuse link has a capacity about twice as great as the rating on the fuse. Thus a 5A time delay will have at least a 10A fuse link. Thus, the fuse can withstand a 100% overload without blowing out.

When the fuse is in use, current passes through both fuse link and heater element, see Fig. 6.

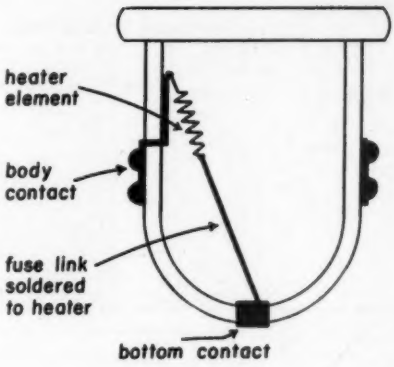


FIG. 6

At normal loads the current passing through the heater is not great enough to heat the element to the fusing point of the fuse link. At an overload up to 50%, sufficient heat to melt the link will not be generated for several seconds. Thus, the fuse will carry temporary overloads without blowing out. However if a 5% overload is carried on for more than several seconds, the fuse link will melt and stop the machine.

(To be continued next month)

Evaporative Condensing

When Water Conservation Is Necessary These Suggestions Will Provide a Practical Way to Dispose of Excess Heat.

By GEORGE H. CLARK, B.S., M.E.*

IN a good many instances water cooling for refrigerating machines may become quite expensive, if we are called upon to use water from a city water supply through our water cooled condensers and then passing our water directly to the sewer. In addition, in some cities the water supply systems are at the present time, or will soon become, unable to furnish the large quantities of water required to take care of large cooling and air conditioning plants; so that for various reasons it is desirable to find methods of getting rid of large quantities of heat without an excessive use of water.

Condensing with air, of course, may be out of the question, as the air requirements to get rid of large quantities of heat are very great, and in addition the temperature rise of the air is quite high, and the heat transfer from refrigerant to air is comparatively low, so that the installation is inclined to be expensive due to requirements of a large coil and large air ducts to carry the air to and from the condenser, provided a source of outside air is used for condensing purposes. An air-cooled refrigerating machine contained in a room, of course, passes considerable more heat to the air from the condenser

*President, Detroit School of Refrigeration. Chairman National Educational and Examining Board, R. S. E. S.

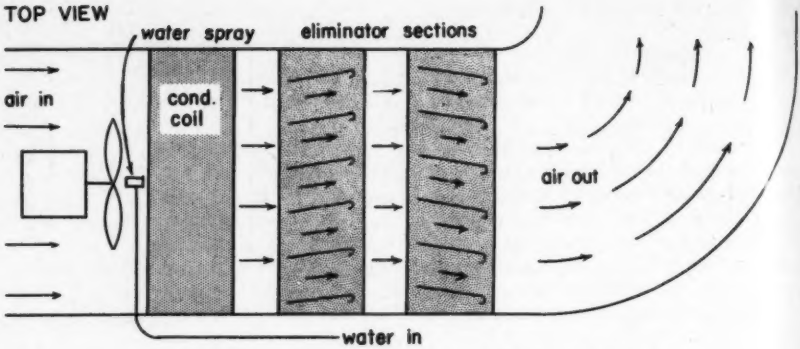


FIG. 1. EVAPORATIVE CONDENSER AND WATER SPRAY.

than it picks up in the evaporator coil, and consequently an air-cooled machine would heat rather than cool a building if the machine was to be located in the building to be cooled.

Evaporative Condensing

A method of getting rid of large quantities of heat, which works out very successfully, consists in using a so-called evaporative condenser. This evaporative condenser is simply an air-cooled condenser, with the additional feature that the air-cooled condenser is kept wet by means of a water spray of some sort, and the air is supplied to the evaporative condenser, possibly from an air duct connected to the outside of the building, after which the air after it evaporates moisture at the condenser, will also be passed by an air duct to the outside of the building; or in many instances it will be practical to combine an exhaust fan effect with the condenser and draw air from the building itself, passing it over the wet condenser surface and through a duct to the outside of the building.

Figure 1 shows this method of exhausting heat. Condensers of this type are apt to be about 80% efficient from the standpoint of the amount of water actually evaporated, compared to the total amount of water used; and the quantity of heat that may be removed with one pound of water then may be compared with the amount of heat that may be removed with one pound of water in the normal water-cooled condenser as follows:

The normal rise in temperature of the water in the water-cooled condenser may be from 20° to 40°. If the water temperature rose 20° as it passed through the condenser, it would indicate that 20 B.t.u.'s were picked up by each pound of water used. On the other hand, if one pound of water is used with the evaporative condenser and only one-third of a pound is actually evaporated and thereby removes heat, we will find that we are still removing approximately 350 B.t.u.'s per pound of water used, as the latent heat of water at the low temperature at which it evaporates is approximately 1050 B.t.u.'s per pound and one-third of this is 350 B.t.u.'s. This indicates that our water consumption would be something like one-eighth of the water consumption for the normal water cooled condenser.

Other Advantages

Another advantage is also obtained by this method of cooling. The condensing temperature, when using the water-cooled condenser, is usually as high as the outgoing water temperature. In some cases the condensing temperature may actually be lower than the outgoing water temperature, while in a large number of cases the condensing temperature is higher than the outgoing water temperature, so that if the water entered the condenser at 60° and left at 100°, the condensing temperature would be in the neighborhood of 100° or higher. When we evaporate water in an evaporative condenser we tend to evaporate it at a temperature close to the wet bulb temperature. The wet bulb temperature in most localities is apt to be 10°

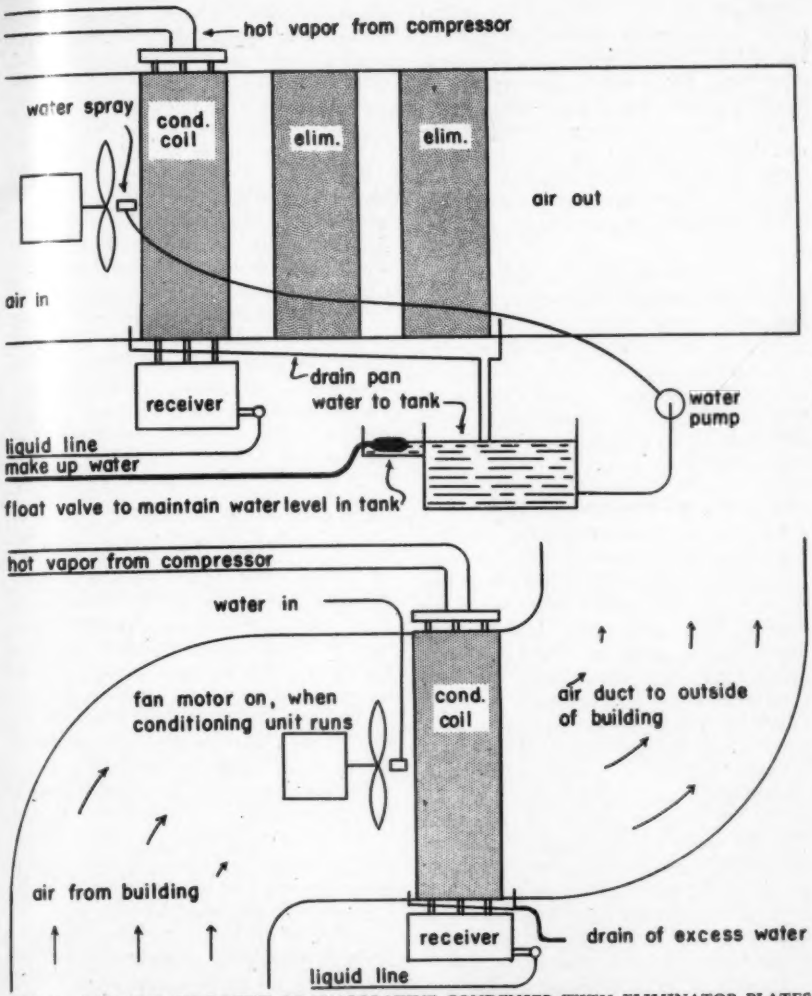


FIG. 2. TOP AND SIDE VIEW OF EVAPORATIVE CONDENSER WITH ELIMINATOR PLATES AND CIRCULATING WATER SYSTEM.

or so below the dry bulb temperature, so that in a good many cases the condensing temperature of the refrigerant may be no higher than the incoming air temperature to the coil, which is, of course, considerably lower than would obtain with the air-cooled condenser, lower by approximately 15° to 40°; and is lower than the temperature at which the refrigerant would condense with a water cooled condenser in a good many cases by around 20°. Consequently, with the evaporative condenser we have a decided economy of water, and in addition a lower condensing temperature and head pressure, which, of course, tends to give us an added economy in power consumption of our condensing unit.

This, of course, is offset by the fact that we do have some power consumption in our fan which is supplying the air; but on the other hand, this would be required also in connection with any air-cooled condenser. We also may have some power required to operate a circulating pump to circulate the water around, if we are trying to be extra economical with water, and use the waste water which drains down from the condenser.

In almost any case it would seem that this evaporative condensing is going to be heard from considerably in the future, as it offers a compact and comparatively inexpensive way of getting rid of large quantities of heat. It is much less bulky and expensive to install than the water towers or spray ponds, which were formerly used in connection with large commercial installations.

Moisture Eliminator Sections

An added feature which might be a paying proposition where the conservation of water is very important, would be the installation of one or two eliminator sections to remove the entrained moisture from the air leaving the evaporative condenser. Each eliminator will remove about 70% of the entrained moisture in the air which passes by it. These eliminator sections consist in general of a parallel bank of eliminator plates, which are flat plates with a hooked edge, so that as the air changes direction as it passes by the plates, the moisture deposits on the plates, while the air makes the change of direction and passes in between the plates. The water passes to the back edge of the plates and down the hooked edge to the bottom where it drains off, and it may be used over again if a circulating pump is used.

Figure 2 shows an evaporative condenser hook-up using eliminator plates and a circulating water pump.

Evaporative cooling has been known to the general service man for years in a makeshift sort of way. An example of this is the air cooled refrigerating machine which has not functioned properly in hot weather due to high condensing pressures, due to the machine being located in a poorly ventilated or hot room. Service men have often caused water to dribble down over these condensers by a fan spray from a hose, or some such procedure. This water on the condenser evaporated to remove the heat, and the head pressure was considerably reduced so that the machines would operate as effectively in the summer time as in colder weather.

D. C. LINGO, HOUSTON, MOVES

D. C. LINGO CO., of Houston, Texas, wholesale distributors of refrigeration supplies, have moved to their new location at 1414 Fannin St., occupying approximately twenty-five per cent more floor space than the previous store.

This new location is situated on one of the main streets, with ample parking accommodations. Stocks have been increased, providing one of the most complete lines in the Southwest.

NEW KF 1505 SEAL MARKETED BY ROTARY SEAL

ADDED to their line of replacement seals comprising some seventy units, the new K F 1505 replacement unit for all Kelvinator and Frigidaire compressors, having a five-eighths inch diameter shaft, has been recently announced by the Rotary Seal Co. of Chicago, Ill. This seal is now being stocked by jobbers as quickly as deliveries can be made. It lists at $1.50.

The principle of operation is the same as the other well-known Rotary seals.

The entire seal assembly rotates with the shaft. Proper pressure exerted by the spring keeps the seal face in perfect contact with its stationary seat at all times.

Design of the parts provides maximum flexibility—more than enough to compensate for any lateral or transverse shaft motion which may be present.

Merely remove the entire old seal. Place the new parts on the shaft in their proper order and replace the original end plate and end plate bolts.

Norbert Hilke,
Missouri.

Enclosed find two dollars for the R. S. E. for which I owe you. I sure thank you for sending me the last two issues because it sure keeps me informed. I think it is the best book put out.

How to Figure
A Specified Truck Installation

Information on the Installation and Servicing of Refrigerated Truck Bodies. A Paper Presented at the Third Annual R.S.E.S. Convention.

By G. D. WANG,* Milwaukee

TRUCK refrigeration is no different than any other refrigeration problem when good engineering and practical experience are combined.

In the past two years there has been a very rapid growth in mechanical truck refrigeration. This is largely due to the careful study and analysis of the results obtained by properly built bodies with properly installed mechanical refrigeration equipment. A great saving has been effected by low cost of operation plus the dependability of safely returning the undelivered products without spoilage. Savings have also been effected on labor, as it is not necessary to unload the products at night, and on the repairs to the body.

There are three component parts to a mechanically refrigerated truck: the body, the low-side or evaporator, and the high side or condensing unit. Let us consider each one separately.

Body

A refrigerated truck body is subjected to a very great physical strain on the highways, and its construction has to be considered differently than on a stationary job. The road shocks and vibration that are set up on a truck body can result in very inefficient performance after being in operation but a short time. One very important factor to take into consideration in truck bodies is moisture in the insulation. In figuring equipment for old bodies careful inspection should be made to determine if moisture is present in the insulation. In considering truck bodies, take into consideration insulation values and construction of the body. There are a number of insulations on the market and a few are listed in Table A giving the thermal conductivity of each showing the "K" factor.

*Field Engineer, Copeland Refrigeration Corp.

TABLE A

Balsa Wood	.380
Corkboard	.300
Celotex	.340
Insulite	.340
Rock Wool	.280
Mineral Wool	.310
Hair Felt	.246
Kapok (Dry Zero)	.240
"Rock Cork"	.328
Balsam Wool	.270
Flaxlinum	.328
Palco Bark	.258

The "K" factor shown is the B.t.u.'s per sq. ft. per inch of thickness, per degree F., difference in temperature on the opposite sides, per hour. Take cork board as an example, which has a "K" factor of .300 per inch. In using 60 inches of cork insulation you will have a "K" factor of .300 divided by 6, or .05 B.t.u. heat transfer through 1-sq. ft. of 6-inches thickness of corkboard. As the human element enters into the consideration of a body, it will not always be built 100% and this results in some additional heat leakage. Taking this into consideration, allow 10% construction heat loss.

Evaporators

The lowside, or evaporators, are either the direct or indirect systems. The direct systems have been made up of bare coils mainly. The indirect evaporators are used the most and are made up of plates, with coils on the inside using a eutectic solution. These plates act as a storage battery storing up refrigeration, and are made up in standard sizes by

manufacturers who make a specialty of holdover plates. The capacities of these plates have been engineered in such a way as to give ample refrigeration and also to give the maximum amount of storage space. The plates are installed in various ways according to the size and construction of the truck. The refrigeration capacities of the plates are calculated by the B.t.u.'s removed from the eutectic solution, plus the square ft. area of the plates. A pre-determined eutectic point is determined. The sensible heat is extracted down to the pre-determined eutectic point. From there on the number of B.t.u.'s per pound is extracted until the eutectic solution becomes entirely solidified and flint hard. Calculations have varied regarding the amount of B.t.u.'s per pound of latent heat extracted. They range from 105 B.t.u.'s to 136 B.t.u.'s per pound from a eutectic point of 8° below. To be safe figure that there are 105 B.t.u.'s of latent heat extracted per pound of eutectic solution. Using this conservative figure is entirely safe. A standard holdover plate using eutectic solution when completely solidified will have approximately 8200 B.t.u.'s of refrigeration. A correct eutectic solution must have a constant eutectic point. Our recommendation is to use only holdover plates manufactured by manufacturers who have had experience with eutectic solutions, and can give the hourly heat loads in B.t.u.'s for their size plates. Attempts to manufacture your own hold-over plates or tanks and using your own eutectic solution formulas may prove to be very costly.

Condensing Units

The condensing units can either be installed on the trucks or remote in the garage. The units on the trucks can be run either by electric motor on the unit, a gas engine unit, or a power take-off. The selection of any of these depends upon the conditions of where the trucks are being used. The units that are remote are either individual units for each truck, or one large unit for a fleet of trucks. More care has to be exercised in the remote units as the human element enters into the connecting and disconnecting of the refrigerant lines. In calculating the capacities of the condensing unit you have to take into consideration the number of hours that the truck will be idle and the capacity of the condensing unit has to be large enough to remove all the heat units in the time that the truck is idle, with enough additional capacity to allow for any unforeseen delay. Use a condensing unit large enough to completely pull down in 10-hours, at least. Dividing the 24-hour B.t.u. heat load by the number of hours will give you the size of compressor necessary. All condensing unit manufacturers have their condensing units rated in B.t.u.'s per hour. By consulting their specifications you can then determine the size of condensing unit to be used.

In order to figure the refrigeration for a truck body it is necessary to obtain completely correct data. The following are data sheets that had been used on a specific truck that has been manufactured and from this you can gain all the information that is necessary to calculate the necessary equipment. (*See Data Sheets "A" and "B".*)

Service Problems

As a service man you will be interested in the analysis of three different service problems that had identical complaints. It should be remembered that the most important part of truck refrigeration is the temperature of the truck when it returns. The temperature of the truck when it returns must not be higher than the maximum high temperature desired as naturally it would spoil the products. Therefore, particular attention must be given to the temperature in the truck bodies at the time that they return and up to the time they are to be pulled down. The three service complaints were that these trucks would return with spoiled provisions as the temperature had gone up 10° to 15° above the maximum high temperature. Upon investigation of the first complaint it was found that the truck had been built over an ice and salt body and that the manufacturer who rebuilt the body did not have enough insulation in the bottom of the truck body; consequently the heat filtration through the bottom brought the temperature too high and resulted in the ice cream becoming soft.

After careful inspection of the truck on complaint number two we had a more diffi-

TABLE A

Data Sheet for Refrigerated Truck Bodies

Name of user: **Withheld.**
Address..... City..... State..... Phone.....

PRODUCTS AND TEMPERATURES DESIRED:

Products to be hauled: .....**Ice cream.** Amount.....**300 gallons**
Temperature desired in truck: **0° F.** Minimum low: **–10° F.** Maximum high: **5° F.**
Temperature of products entering body: **–10° F.** Time of day, A. M.: ..... P. M.; **6.00.**
If perishable foods, give lowest temperature allowable: .....

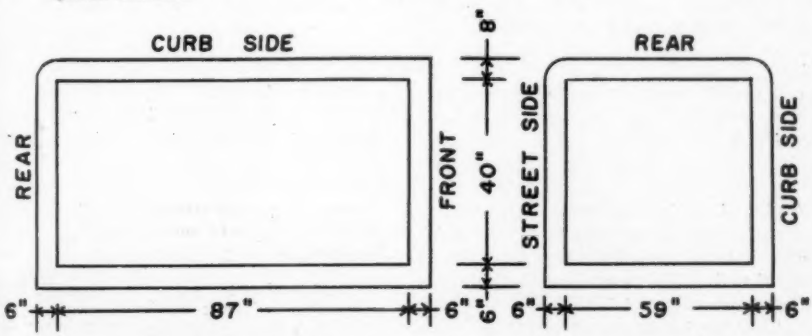
SERVICE CONDITIONS:

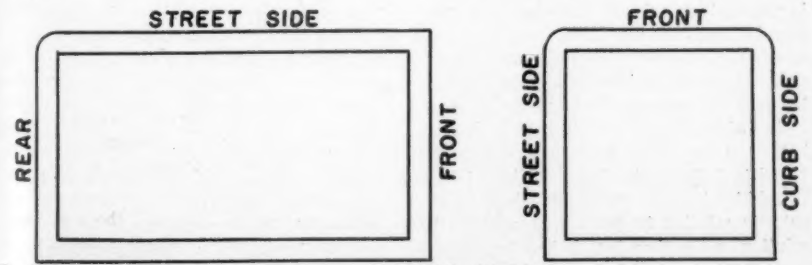
Way products shipped and dimensions of containers.....**2½ gal. metal & paper cans**
Dimensions of containers: .....**10½ inches high x 10¼ inches in diameter.**
Will truck be used for city delivery: .....**yes.** Cross country hauls: .....**no.**
Daily mileage: ..... Number of stops: ....**60.** Average time at stops: ....**5 minutes.**
Number of times doors open: .....**60.** Average time each opening: .....**2 minutes.**
Hours truck will be away from plant at one time: .....**10 hours.**
Time leaving plant: ....**7 A. M.** Time ret'd: ....**5 P. M.** Max. high outside temp.: ....**100° F.**
Average outside temperature around body at night pull-down.....**70° F.**
Give any other condition body will be subjected to: .....**Surplus ice cream checked in, and truck reloaded with ice cream for next day's delivery before pull-down.**

METHOD OF REFRIGERATION:

Unit installed on truck: .....**No.** Remote: .....**Yes.** Gasoline engine: .....**No.**
Motor takeoff: .....**No.** Make of unit: .....**Withheld.** Model: .....
Refrigerant used: .....**Methyl.** Air cooled: .....**No.** Water cooled: .....**Yes.**
Motor size: .....**¾ Hp.** Kind of electric current A.C.: .....**Yes.** D.C.: .....**No.**
Volts: .....**220.** Cycle: .....**60.** Phase: .....**1.**
Truck chassis: .....**Yes.** Trailer: .....**No.** Semi-trailer: .....**No.**
Inside dimensions—Length: ....**87 inches.** Width: ....**59 inches.** Height: ....**40 inches.**
Insulation thickness—Floor: .....**6 inches.** Walls: .....**6 inches.** Roof: .....**8 inches.**
Kind of insulation—Floor: .....**Cork.** Walls: .....**Dry-Zero.** Roof: .....**Dry-Zero.**
Outside dimensions—Floor: .....**99x71 inches.** Sides: .....**99x54 inches.**
Outside dimensions—Ends: .....**54x71 inches.** Roof: .....**99x71 inches.**
Number of doors on street side: .....**None.** Size: .....
Number of doors on curb side: .....**Two.** Size: .....**26x22 inches.**
Number of doors on rear:.....**One.** Size: .....**30x22 inches.**
Describe any other features: .....**Supports built in body for hold-over plates.**
.....
.....
If body now in use, built by whom: .....**New.** Age: ..... How refrigerated: .....
Condition of insulation—Good: ..... Fair: ..... Poor: .....
Condition of doors and gaskets—Good: ..... Fair: ..... Poor: .....
Describe inside partitions and supports, and if removable: .....
.....

Use following sketch to show location of doors, offsets in floors, partitions, and any other special features.





Dealer of truck mfg.
.....
(firm)
By .....
Title .....

Submitted by:
.....
(firm)
By .....
Title .....

TABLE B

How to Figure Truck Refrigeration

Inside dimensions of body—Length: .....**87 in.** Width: .....**59 in.** Height: .....40 in.
Insulation: Floor: .....**6 inches cork.** Sides: .....**6 inches Dry-Zero.**
Ends: .....**6 inches Dry-Zero.** Roof: .....**8 inches Dry-Zero.**
Product to be carried: .....**Ice cream.**
Hours in service: .....**10 hrs.** Temperature difference: .....90°
Number of door openings: .....**60.** Average time: .....**2 min.**

OUTSIDE AREA OF BODY:

Floor—	
Inside length 87 inches plus 12 inches (insulation 2 walls) = 99 inches	
Inside width 59 inches plus 12 inches (insulation 2 walls) = 71 inches	
(Outside length) 99 inches × (Outside width) 71 inches ÷ 144 =	48.8 sq. ft.
Roof—	
Inside length 87 inches plus 12 inches (insulation 2 walls) = 99 inches	
Inside width 59 inches plus 12 inches (insulation 2 walls) = 71 inches	
(Outside length) 99 inches × (Outside width) 71 inches ÷ 144 =	48.8 sq. ft.
Sides—	
Inside length 87 inches plus 12 inches (insulation 2 ends) = 99 inches	
Inside height 40 inches plus 14 inches (insul. floor & roof) = 54 inches	
(Outside length) 99 inches × (Outside height) 54 inches ÷ 144 × 2 =	74.3 sq. ft.
Ends—	
Inside width 59 inches plus 12 inches (insulation 2 walls) = 71 inches	
Inside height 40 inches plus 14 inches (insul. floor & roof) = 54 inches	
(Outside height) 54 inches × (Outside width) 71 inches ÷ 144 × 2 =	53.2 sq. ft.
Total outside area	225.1 sq. ft.

HEAT LEAKAGE:

For one degree temperature difference.

Floor area	48.8 sq. ft. × .05 B.t.u.	=	2.440 B.t.u. per hr.
Roof area	48.8 sq. ft. × .03 B.t.u.	=	1.464 B.t.u. per hr.
Sides area	74.3 sq. ft. × .04 B.t.u.	=	2.972 B.t.u. per hr.
Ends area	53.2 sq. ft. × .04 B.t.u.	=	2.128 B.t.u. per hr.
Total B.t.u. load per hr. 1° temp. dif.		=	9.004 B.t.u.
Add 10% for construction allowance		=	.900 B.t.u.
Total B.t.u. load per hr. 1° temp. dif.		=	9.904 B.t.u.

TEMPERATURE DIFFERENCE 90°:

90° (temp. dif.) × 9.9 B.t.u. = 891 B.t.u. per hr.	
891 B.t.u. × 10 (truck on road 10 hours) =	8,910 B.t.u.
60 door openings at 2 min. each = 120 min. or 2 hrs.	
891 B.t.u. × 2 hrs. = 1782 B.t.u. × 2 (twice normal load) =	3,564 B.t.u.
891 B.t.u. × 14 (lay over period 14 hrs.) =	12,474 B.t.u.
Total B.t.u. for 24 hrs. for 90° temp. difference	24,948 B.t.u.

cult problem as the truck body would pull down very fast and low. The truck body was well insulated and showed no traces of abnormal heat losses. The condensing unit was of more than ample capacity. Upon further investigation we learned that a eutectic solution was being used in the hold-over plates which had not been tried before. By changing the eutectic solution satisfactory results were obtained.

After an inspection of complaint number three it was found that the truck body was in first-class condition and the hold-over plates and eutectic solution were standard and proven satisfactory. The condensing unit that was on the truck had a B.t.u. rating of ample capacity to handle the job, but upon carefully checking this unit we found that the condensing unit did not have the ability to pull out the B.t.u.'s from the eutectic solution to completely solidify the solution in the time that it had to operate. As this experience had been encountered before, it was eliminated by installing another condensing unit that had a size smaller motor with a compressor of greater efficiency in low temperatures.

In choosing condensing units for ice cream trucks, care should be taken to select units designed for low temperatures.

Refrigeration for High Temperature Truck Bodies

For high temperature truck bodies follow the same procedure as shown in charts except that the products at temperatures above freezing are generally warmer when they are loaded than the temperature desired in the truck. This naturally would increase the refrigeration load. To figure this addition in load multiply the weight of products in pounds by the specific heat of the product. Then multiply this result by the number of degrees the temperature needs to be lowered. As an example: 1000 lbs. of lean beef

at 50° F. put in a truck at 38° F. would add $1000 \times 0.77 \times 12 = 9240$ B.t.u. to the service load.

TABLE D

NAME	PERCENT WATER	AFTER FREEZING	BEFORE FREEZING	LATENT HEAT OF FUSION
Apples	83	....	0.92	...
Beef, Lean	72	0.41	0.77	102
Beef, Fat	51	0.34	0.60	72
Berries	....	....	0.42	...
Butter, Tubs	....	....	0.55	...
Cabbage, Bulk	91	0.43	0.93	129
Carrots	83	0.45	0.87	113
Cheese, Cream	....	....	0.64	...
Cream, Fresh	59	0.38	0.90	84
Eggs, Storage	70	0.40	0.76	100
Eggs, Freezing	70	0.40	0.76	100
Fish, Freezing	73	0.43	0.82	111
Ice Cream, Freezing	67	0.45	0.78	90
Milk, Fresh	88	0.47	0.90	124
Mutton, Chilling	....	0.67	0.81	100
Oysters, Shell	80	0.44	0.84	114
Pork, Chill	....	0.30	0.51	55
Tomatoes	94	....	....	...
Veal	63	0.39	0.70	90

COPELAND EXPANDS SALES OUTLETS

PLANS for a country-wide expansion of its sales outlets during 1937 were revealed by the Copeland Refrigeration Corporation of Detroit with the announcement by Dallas E. Winslow, president, that, effective December 1st, a complete factory and field sales organization had been established to undertake the new program.

"During the past year, as the industry knows, Copeland household refrigerator sales have been handled by the Trucson Steel Company's field organization," said Mr. Winslow. "Marked progress was made during this period.

"By taking over the splendid work done by the Truscon organization, so that Copeland will have direct relationships with its distributors and dealers, we will be in far better position to bring Copeland to a position of real leadership, and it is our definite purpose to attain it.

"The culmination of this program is the result of many months of careful planning. Besides establishing our own factory-directed sales organization, we have stepped up our productive facilities in anticipation of a banner year, we have improved our product and added new models to our line so as to give our dealers a complete range of sizes and, finally, we have embarked upon a complete national program of advertising and merchandising so as to bring Copeland prominently before the public and to support our dealers with every known sales help."

Heading the new sales organization, Mr. Winslow announced, are Mr. James D. McLeod as general sales manager and Mr. W. G. von Meyer as sales manager.

Mr. McLeod joins Copeland with a long and successful history as a sales executive, including twelve years on the sales staff of the Chevrolet Motor Company. Mr. McLeod also is well known as vice-president and director of the Whitwood Engineering Corporation of Detroit and as a director of the Unitor Corporation of Detroit.

Mr. von Meyer, who has been associated with Copeland since 1933, is a pioneer in the industry, his first contact with household refrigeration dating back 18 years when he was with General Motors Research Laboratories. He was with Nizer and Kelvinator Corps. for seven years.

"As one of the real pioneers in the electric refrigeration industry and as a company whose engineering skill and whose products have always enjoyed the highest reputation in both the domestic and commercial fields, Copeland is in position to register tremendous progress during 1937," said Mr. Winslow. "We intend to put into this program the man-power, the management, the resources needed to do the job on a major scale."

Frank Albert,
Pennsylvania.

I have not received my November issue of the R. S. E. I would rather do without my Thanksgiving dinner than to be without this bright, interesting and instructive magazine. It is the best monthly of its kind on the subject published today. It contains real and useful information. I can confidently recommend it to anyone seriously interested in refrigeration.

Field Methods
Charging Refrigeration Apparatus

Proper Procedures for Charging Household and Commercial Equipment in the Field, as Well as Shop.

By L. K. WRIGHT, *Mem. A. S. R. E.*

THE preponderance of refrigeration equipment used in household and commercial applications may be divided into three distinct groups, viz.: (1) household apparatus having both suction service and discharge service shut-off valves; (2) household equipment provided only with one service valve, generally the discharge service shut-off valve, and (3) commercial equipment provided with a three-way liquid shut-off valve or a special charging valve teed into the liquid line.

Each of these groups has its own special method of charging, listed as follows:

Group 1—By Gas Method—with machine running

Group 2—By Liquid Method—with machine idle

Group 3—By Liquid Method—with machine running

Group 2 refers only to household apparatus and group 3 to commercial equipment. In many cases the smaller commercial machines will be found devoid of liquid shut-off valves of the three-way type or of special charging valves, in which case they should be assigned to group 1.

Gas Method of Charging

All small systems equipped with suction service shut-off valves (SSSOV) and discharge service shut-off valves (DSSOV) should be charged by the gas method. This includes household and those commercial machines not equipped with liquid service or special charging valves.

The procedure for charging, given step by step, is as follows:

1. Attach a standard gauge test set (GTS) to system. To do so apply a tee wrench (not a ratchet) and make sure both DSSOV and SSSOV are back seated (BS). This is accomplished by lifting the valves off their BS. If they are felt to lift or jump off BS, or are found to be off BS, return them to BS position. Remove the pipe plugs from the service openings of these valves, using a 12 point wrench, and insert half unions (usually ⅛" P.T. x ¼" S.A.E. Flare). Sometimes elbow half unions must be employed due to cramped quarters. In some cases half unions have been left in place by a previous serviceman, with a bonnet and nut on the end to prevent leakage. In such cases merely remove nuts and bonnets, attach gauge test set (GTS), having the high pressure tee valve (HPTV) of set tied to the DSSOV service port and low pressure tee valve (LPTV) of set attached to the service port of SSSOV. Make all nuts up tight, save the one on the SSSOV, which is left finger loose. Have the HPTV open, middle leg (ML) of set bonneted, and LPTV open. Then crack DSSOV off BS and blow lines and GTS clear of air. When air is thought blown out by the refrigerant, tighten loose nut on SSSOV service port.

2. Close HPTV and LPTV on GTS.

3. Attach line from ML of GTS to service cylinder of refrigerant. Have flare nut on cylinder finger loose; nut on ML tight.

4. Crack HPTV so that air in charging line will be driven out at loose flare on cylinder. Make up tight when air is expelled. If necessary lift DSSOV off BS again for more gas. See note below.

5. Pull electric plug so unit cannot start.

6. Front seat (FS) the SSSOV.

7. Close HPTV.

8. Open LPTV wide.

9. Lift DSSOV off BS, so a high pressure (HP) gauge can be secured while charging.

Readjust DSSOV when machine is operating if gauge hand is too lively or "dead."

10. Put refrigerant cylinder in a pail of warm water (100°-120° F.), valve end up. The liquid refrigerant in the cylinder must receive heat in order to vaporize. Therefore warm water must be used. Do not use hot water, as excessive temperature may melt the metal in the safety plug or rupture the safety disc. Use only warm water and stir while charging, otherwise water will stratify, cold at the bottom and warm at top. If necessary have another pail of warm water ready and change vessels if required. A torch can be used to supply heat, but it must be used carefully. Do not localize heat. Keep torch moving. If a burned spot is produced on the cylinder same cannot be recharged without being tested. Water is the best method of adding heat.

11. Apply tee wrench to refrigerant cylinder valve and crack this valve until pressure is observed to rise on LP gauge.

12. Start machine.

13. Immediately watch LP gauge and readjust cylinder valve to hold a certain back pressure. Hold refrigerant pressure to that corresponding to a 20° F. boiling point.

14. Continue to charge, holding back pressure constant by manipulating the cylinder valve, until correct head pressure is secured. Refer to data given under heading, "Determination of Proper Charge in Air-Cooled Units," which appeared in the April, 1936, issue.

15. Stop machine when charge is assumed correct.

16. Shut cylinder valve.

17. Remove cylinder from water. Leave cylinder, GTS and all lines in place.

18. Open SSSOV and leave off BS, so gauge reading can be secured.

19. Operate machine and at the end of 10 minutes take gauge readings and compare with chart. If charge is correct, BS the DSSOV. Open HPTV. When HP gauge reads same as LP, BS the SSSOV. Remove test lines. Apply bonnets and flare nuts, or use pipe plugs to seal service valves. Machine is correctly charged.

If head pressure shows in complete charge, add more refrigerant, as per data given previously. If head pressure is excessive, indicating overcharge, have LPTV closed. Open HPTV and open cylinder valve. This will allow refrigerant to blow back into refrigerant cylinder. If necessary cool cylinder. When head pressure is correct, remove test lines and GTS.

Notes on Gas Charging Method

In step 4 the HPTV was cracked to permit high pressure refrigerant vapor from the machine to enter the charging line and blow out the air it contained. This assumes refrigerant in the system. Air tends to rise in a system and to lie in the discharge line and top of condenser. Thus, by using the outline covered in step 4 any small amount of air or foul gas is removed along with the air in the charging line.

If desired, the nut on the cylinder may be made up tight and the nut on the ML of GTS left loose. Crack drum valve and blow air out of loose flare nut on GTS. This method will obviously have to be followed if system is entirely empty or evacuated of all refrigerant.

To determine the amount of refrigerant charged into the system weigh cylinder before and after charging.

Where a dry system, shown diagrammatically in Fig. 1, is encountered, see that the liquid shut-off valve (LSOV) is open and left so during charging period. The automatic constant pressure expansion valve (ACPEV or thermostatic expansion valve (TEV), if in operating order, automatically closes and prevents excessive liquid from entering the evaporator (Evap.).

Where a low side float valve (LSFV) system is encountered, as diagrammatically shown in Fig. 2, the evaporator gas valve should be checked and left wide open. The evaporator liquid shut-off valve (ELSOV) or the liquid shut-off valve (LSOV) should be closed before beginning to charge. Watch head pressure (HP) gauge while charging and when it rises to about normal pressure open the closed LSOV or ELSOV, whichever was closed and allow the liquefied refrigerant stored in the receiver to run over into the evaporator. Then close valve again and repeat procedure.

If the LSOV or ELSOV be left open the high pressure gas in the condenser will

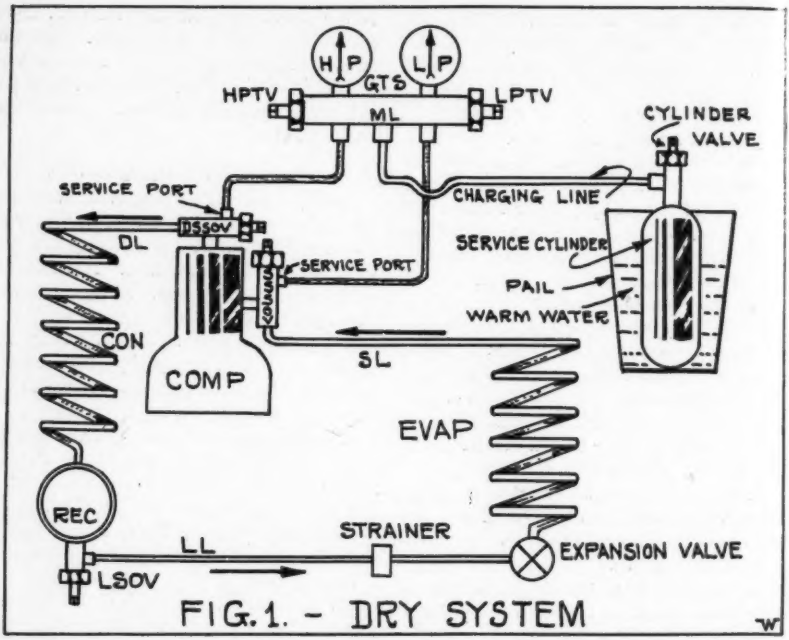


FIG. 1. - DRY SYSTEM

rush through the receiver, liquid line and into the low side where it will condense. In condensing in the evaporator it will throw off heat and warm up the refrigerator. Thus heat will only have to be removed again.

Where the low side float is of the ball type the high pressure built up in the low side may collapse the ball. Obviously no damage would occur where a bucket type was used as the float.

The gas method of charging is one which lends itself to the many types of equipment on the market and is the one approved by all manufacturers of apparatus of standard design. It should be used wherever possible. Any dirt, slag, oxide or extraneous matter existing in the refrigerant cylinders remains at the bottom and only the pure vapor is removed. Hence, no dirt can get into a system while charging by the gas method.

By feeling the refrigerant cylinder the amount of liquid remaining can be ascertained by the chill or frost line on the cylinder and the service man will have an idea as to whether to return the cylinder to the shop for refilling or if sufficient remains for charging another machine. Sometimes the service man has to use several drums in order to get the correct charge into a system.

Liquid Charging of Small Apparatus

On small household units where only a suction service shut-off valve (SSSOV) or a discharge service shut-off valve (DSSOV) exists (and generally it is the latter) charging must be done by the liquid method.

It is important to bear in mind that during the entire charging period the machine is rendered inoperative by pulling the switch and remains idle while charging.

The sketches, Figs. 3 and 4, indicate that the method is the same for charging into the SSSOV as for the DSSOV.

The refrigerant cylinder is best suspended from a spring scale, with the valve down. A charging line is connected to drum and service port. It is imperative to use a strainer in the charging line to prevent any drum scale from entering the apparatus.

Where a number of machines are to be

charged by this method, mark the direction of flow of refrigerant through the strainer and be sure to insert strainer in the charging line each time in correct manner.

The charging line must be blown clear of air. This is preferably done before the cylinder is inverted, for with the valve up and flare nut on the service port loose, gas can be blown through the line to clear out the air. If the drum is inverted and valve opened, liquid will run into the charging line. This is dangerous practice as the liquid escaping at the loose flare may splash into eyes or on skin.

Heat must be applied to the refrigerant cylinder, preferably by use of an alcohol torch, which causes no soot to form. The heat must not be localized and entire drum and contents should be warmed up to about 100° F.

To charge system have service valve (DSSOV or SSSOV) set midway. Then crack refrigerant cylinder valve and allow charge to enter system. When charge is thought correct, shut cylinder valve and BS the service valve.

Turn machine over by hand a few times to clear any liquid from the head and piston. Then operate machine, pulling plug instantly if liquid slugging is heard and turning flywheel by hand a half dozen times before plugging in again.

There is no known method of correctly estimating the charge required in such apparatus and a test run is required. If evaporator is not fully frosted, system is undercharged. If suction line frosts (or compressor crankcase as well) system is overcharged. Thus, refrigerant will have to be taken out or added. As it is somewhat easier

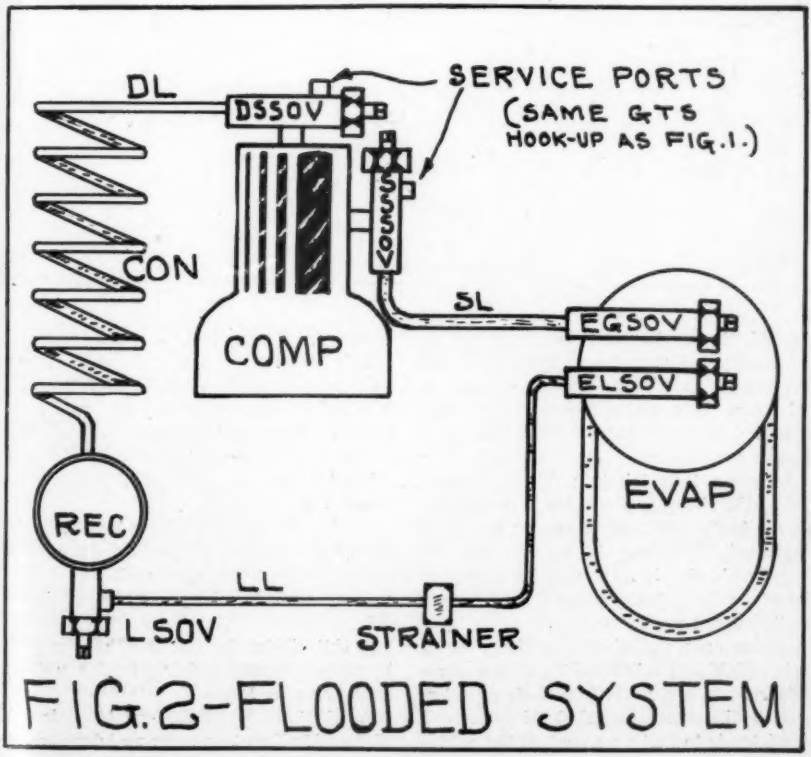
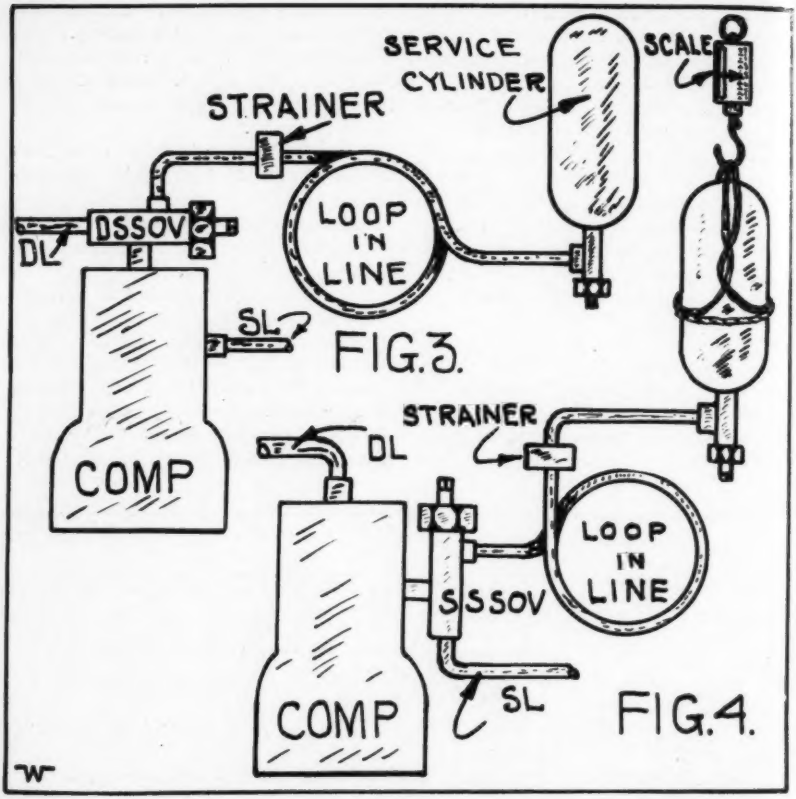


FIG. 2-FLOODED SYSTEM



to add, the service man should try not to overcharge and should attempt to gauge the amount required by first giving the unit a trial run. Then add refrigerant, say, from 2 to 4 ounces and observe change in frost line on evaporator.

In order to weigh in refrigerant accurately the charging line must be looped, as shown in the sketches, if copper tubing is employed. The loop is to take up the "spring" in the line. If a flexible charging hose is available it can be used to advantage as it does not require looping.

Where only a discharge service shut-off valve (DSSOV) exists and the charge of refrigerant is accurately known, from reference to the manufacturer's label or data, it is advisable to first pump out all the refrigerant left in the system. It will be assumed a leak occurred, such as a loose flare, and that the leak has been checked. Naturally, if a leaky seal or other trouble, such as a leaky (porous) gasket, be encountered, this source of leakage must first be eliminated; otherwise charge after charge can be pumped into the unit.

Having discovered and repaired the leak, the refrigerant can be pumped out of the system by the following procedure:

1. Check DSSOV and see that it is on BS.

2. Attach line from DSSOV service port to an empty service drum, leaving nut on cylinder finger loose.

3. Lift DSSOV off BS and blow air out of charging line; then make up loose flare.

4. Front seat (FS) the DSSOV.

5. Open service cylinder valve wide. Note: Some of the smaller cylinders have valve stems which unscrew; therefore, if this type is encountered only open stem 4 full turns. Open all other valve types wide.

6. Start machine and allow to operate until frost disappears from the evaporator. If desired, empty cylinder may be immersed in a pail of cold water. This will give rapid condensation and low head will result in faster pump down time. Where the quantity of refrigerant left in the system is under 8 ounces the cylinder need not be immersed in cold water.

7. When all frost has disappeared, unit may be assumed to be empty.

8. Stop machine. Close cylinder valve. BS the DSSOV. Remove line and drum. Unit is ready to receive correctly weighed in charge.

For determining correct operating conditions refer to "Determination of Proper Charge in Air-Cooled Units."

Liquid Charging of Commercial Units

Most commercial systems have suction service shut-off and discharge service shut-off valves, as well as a three-way liquid shut-off valve (LSOV) or a special charging valve teed into the liquid line.

Assuming a three-way liquid shut-off valve, as per Fig. 5, the procedure for charging is as follows:

1. Test LSOV and make sure it is on BS. Attach half union to service opening.

2. Attach charging line, with strainer, to refrigerant cylinder and make up tight.

3. Where line connects to LSOV service port, leave flare nut finger loose.

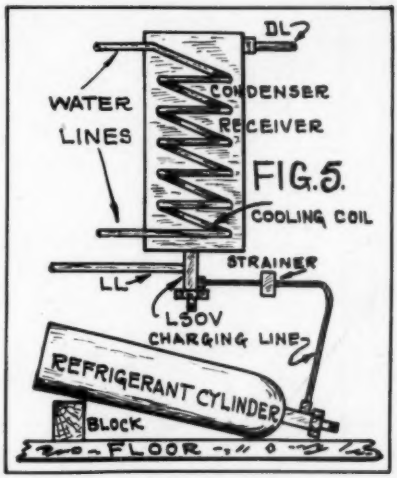
4. Have cylinder upright (valve up) and crack cylinder valve. The high pressure refrigerant vapor will blow air out at loose flare. Make flare nut up to tight when air is thought blown out. Close drum valve.

5. Lay drum on floor and block up, as shown in sketch. If desired, drum can be stood upright, valve down.

6. With drum valve closed, front seat (FS) the LSOV.

7. Open drum valve wide.

8. Start machine and operate until unit is thought charged. Check water-cooled jobs by use of "Water-Cooled Data," and air-cooled systems, by data given under "Determination of Proper Charge in Air-Cooled Units."



9. When correctly charged, first close drum valve. Then BS the LSOV.

10. Remove block from bottom of drum and place block at valve end of drum, or set drum upright, valve up. The latter is the better procedure.

11. Open drum valve several turns.

12. Apply torch to charging line and strainer to vaporize liquid and force the gas over into the refrigerant cylinder. This is really only necessary with sulphur dioxide, as methyl choride or F-12 can be blown directly to the air without tainting the room atmosphere.

13. With line heated in case of sulphur dioxide, or left as is in the case of methyl chloride or F-12, close cylinder valve and crack a flare nut, preferably at the cylinder. This is the highest point of the charging line and only gas will come out, whereas if cracked at a low level any liquid in the line will be blown out. Use care in cracking the flare nut, holding one hand over nut as a shield to prevent liquid from spraying into the face and eyes.

14. With line emptied of refrigerant, remove cylinder and line.

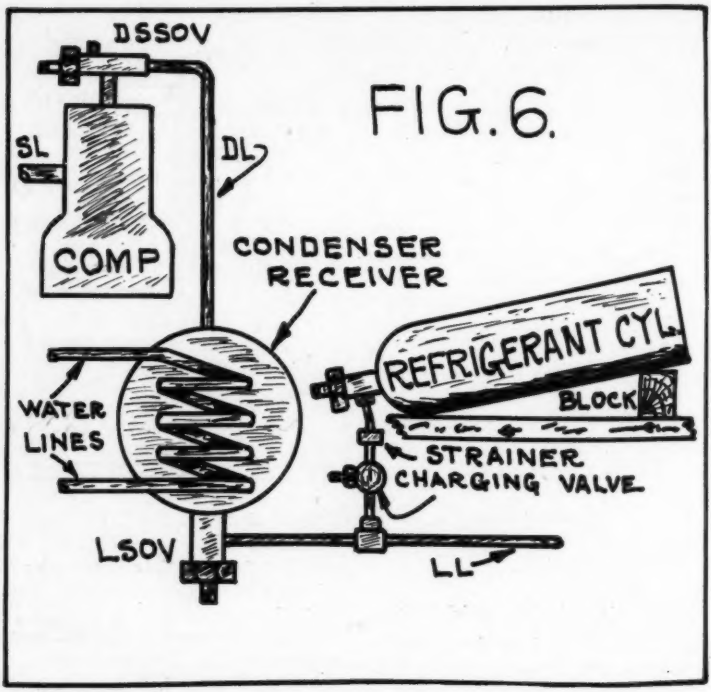


FIG. 6.

Where a special tee valve is found in a system, or where a shut-off valve is screwed into a tee in the liquid line, charging operations are quite similar to the foregoing. The liquid shut-off valve at the condenser-receiver is closed, cylinder hooked up to the tee valve as previously outlined and then both drum and tee valve are opened to permit liquid to flow into the liquid line until unit is thought charged.

When system is charged, the drum valve is first closed and unit operated for 5 or 10 minutes, or until the liquid line chills. This relieves the liquid line of liquid refrigerant and then the tee valve can be closed. Upon breaking the charging line connection only a little gas will be found in the line.

Open LSOV and allow unit to operate.

Special Cases

If a low side float valve (LSFV) system (such as shown in Fig. 2) be encountered and it is known that nearly all the charge has escaped and that upwards of three pounds refrigerant must be gotten into the system the following procedure will shorten the charging time. The same procedure can be followed where a commercial unit is encountered which has no special tee valve or 3-way LSOV, a simple 2-way LSOV being found on the receiver. The commercial hook-up will be assumed to be as shown in Fig. 2, with a low side float evaporator equipped with service valves.

To speed up the charging of such systems, proceed with the outline which follows:

1. Close LSOV.
2. Operate machine until liquid line chills down and then warms up, indicating all liquid has evaporated and only gas remains in the line.
3. Close evaporator liquid shut-off valve (ELSOV).
4. Crack flare nut at LSOV on receiver and let gas bleed out. Then remove line from LSOV.

5. Attach a strainer to this liquid line (LL) and attach a piece of tubing from strainer to refrigerant cylinder, leaving nut on latter finger loose.

6. Crack the evaporator liquid shut-off valve (ELSOV). This will permit refrigerant to blow through line and blow air out at loose flare on cylinder. Tighten up loose flare when air is thought blown out.

7. Open ELSOV wide.

8. Block up end of refrigerant cylinder or stand it up with valve end down. Open cylinder valve.

9. Start machine and operate for several minutes. Then stop machine for several minutes. Due to lowered pressure in evaporator liquid will continue to run into low side and unit will be charging even with motor stopped. In some cases machine can be kept running continuously. Watch HP gauge so that too much refrigerant is not pumped into the receiver.

10. When hissing sound ceases in the low side float evaporator, same is filled to proper level with refrigerant and preparations should be made to disconnect the refrigerant cylinder. First close cylinder valve.

11. Keep machine operating and heat liquid line with a torch to vaporize liquid in it. When thought empty, close ELSOV and stop machine.

12. Crack nut on cylinder and when gas pressure is released remove strainer and charging line. Reattach liquid line to LSOV on receiver and make up tight.

13. Open LSOV on receiver and ELSOV on evaporator.

14. Give test run and if necessary add refrigerant by the gas method.

The foregoing will permit charging in very rapid order, whereas straight gas charging will require three to four times as long.

Forcedraft Unit Coolers How to Use Them and Specific Examples of How to Figure

Don'ts for the Service Engineer When Using Unit Coolers. Definite Place for Unit Coolers and Convection Units in Refrigeration Installation.

By MR. J. ASKIN *

IN discussing the subject of Forcedraft Unit Coolers with several service engineers I found some very wide differences of opinion. I started to ask one of the men where to use them, but I got no further, as his reply was, "Don't touch them—they are poison." I asked him why. He answered that some time ago he installed one and the so and so thing did so and so, and finished up with "Don't touch them—they are poison."

Another service engineer whom I asked the question, "Where would you use Unit Coolers?" answered, "Use them anywhere to cool anything that requires a temperature of 38° or higher. I have used dozens of Unit Coolers without any trouble, and would not use anything else. Just use them intelligently and you will have no trouble." I continued my investigation and found this variance of opinion, from one extreme to the other, to exist. I have seen many installations that were good and some that were poor, and as a result of my observations I have come to the conclusion that Unit Coolers do have something peculiarly different about them which requires a little more attention than coils.

Unit Coolers are being used for every con-

*Fedders Manufacturing Company, Buffalo, New York.

ceivable purpose. I have seen them used in precooler rooms for cooling beer, in huge vegetable coolers, meat coolers, mushroom cellars, show-cases, dairy boxes, fur storage rooms, living rooms, and even in undertaking establishments for preserving cadavers.

The second service engineer to whom I spoke made a very broad statement. He said, "Just use them intelligently." That made me think. Just what did he mean by an intelligent installation? I investigated and found that to obtain a good installation there are several things which a person is *not* to do. The things which the service man is to do in making an intelligent installation seem to be known by him.

Don'ts

The ten "don'ts" of Unit Coolers are as follows:

(1) Don't select an undersized unit for the job.

(2) Don't try to obtain temperatures much below 30° F. in the refrigerator.

(3) Don't set the pressure control at too close a differential.

(4) Don't set the pressure control so that the cut-in pressure is at or below the pressure corresponding to the melting point of ice.

(5) Don't install the unit above the door.

(6) Don't use a thermostat for either controlling the compressor motor or the fan motor.

(7) Don't use Unit Coolers in meat coolers where there is an extremely slow turnover of the products.

(8) Don't arrange a shut-off switch for the fan-motor unless it is absolutely necessary.

(9) Don't tell the customer that you positively guarantee that the Unit Cooler will maintain a certain definite relative humidity in the box.

(10) Don't knock competitive units or units which you do not happen to be installing.

Some of you may wonder why I called these units by any one name rather than by another. That first service engineer whom I asked about Unit Coolers had a name all of his own which I don't dare repeat here.

Some of the names given to this type of evaporator which essentially consists of a coil, a thermostatic expansion valve, a fan, a motor and a casing are:

Blower Coil
Forcedraft Unit Cooler
Cold Diffuser
Humidraft
Unit Cooler
Forced Convection Cooling Unit
Convector
Conditioned Air Cooling Unit
Humi-Tempt Unit
Humidi-Cooler.

The use of Unit Coolers, as I favor to call this type of unit, came into general use several years ago. It was discovered that in a given size refrigerator, if a coil of 100 sq. ft. surface was necessary to cool this refrigerator down to 38° F., by placing a coil with a fan and motor behind it the coil size could be reduced to approximately 33 sq. ft.; and equally good results and equally cold temperatures could be obtained. It was also discovered that if a Unit Cooler having more than 33 sq. ft. surface was to be used for this refrigerator much better results could be obtained. Some of these are the addition to better circulation, closer temperature differential and more uniform temperature, higher relative humidity, and less drying out of the food in the refrigerator; and the unit could also be operated at higher suction pressures. This would increase the capacity of the condensing unit, and would result at times in the selection of a smaller size compressor. And so these Unit Coolers began to be used in preference to natural convection type of coils. The Unit Cooler had another advantage, and that is it was more compact so that greater storage space in a given size refrigerator was available by using such a unit in preference to natural convection coils.

Place for Unit Cooler

For a while it appeared as if Forcedraft Unit Coolers were to entirely replace natural convection units. Then as their use began to increase things looked like they were going the other way and it appeared as if Forcedraft Unit Coolers were to be condemned entirely, for who didn't have trouble with his first installation? Today, however,

we find that both Unit Coolers and natural convection coils are being sold side by side, and that both types serve a useful purpose in the refrigeration industry.

Determining Size

To determine how to select the proper size unit for a given refrigerator let us first determine what the load is on that refrigerator. Let us select at random a walk-in cooler 6 ft. wide by 8 ft. deep by 9 ft. high, having 3 in. cork insulation. It is desired to maintain 40° box temperature, and the location of the Unit is in a town where the maximum air temperature reaches 100° F. The installation is in an establishment where a heavy service condition exists. In other words, the refrigerator doors are opened often and occasionally a load of warm meats are placed in this refrigerator. At this point let me state that most manufacturers agree fairly closely as to the heat transmission loss through the insulation, but no two agree as to the service load. By service load I mean heat loss due to opening and closing of doors, product load of warm foods stored in the refrigerator, warm air infiltration, lights in the refrigerator, Unit Cooler motor, etc.

One manufacturer adds the Unit Cooler's motor load. The others either neglect this load or have the heat of the motor deducted from the rated capacity of the unit. One manufacturer almost neglects entirely the heat loss through the floor; the others treat the floor as if it were one of the sides of the refrigerator. One manufacturer uses a single factor for both heat loss through the insulation and service; one or two others use a factor based upon the volume of the interior of the refrigerator. The manufacturers have not, as yet, gotten together to work out a code for determining the loss of a given refrigerator, and for determining the method of rating Unit Coolers. In other fields, such as in Unit Heaters and in compressors, a very strict code exists, and most manufacturers adhere to this code 100 per cent. Until such time that codes are adopted for determining the heat loss of a refrigerator and for determining the selection of Unit Coolers, it will be necessary to refer to the catalogs printed by the particular manufacturers whose line of units you happen to be using.

The methods used by these manufacturers for determining heat loss and size of unit are very interesting and instructive, but I will not take up your valuable time to go into details. However, I am giving here a summary of what the load would be for the 6-ft. by 8-ft. by 9-ft. refrigerator in question as different manufacturers would figure it. The heat losses were computed by representatives of these different manufacturers, and although I hesitated to mention their names I find it necessary in order to carry across to you my message.

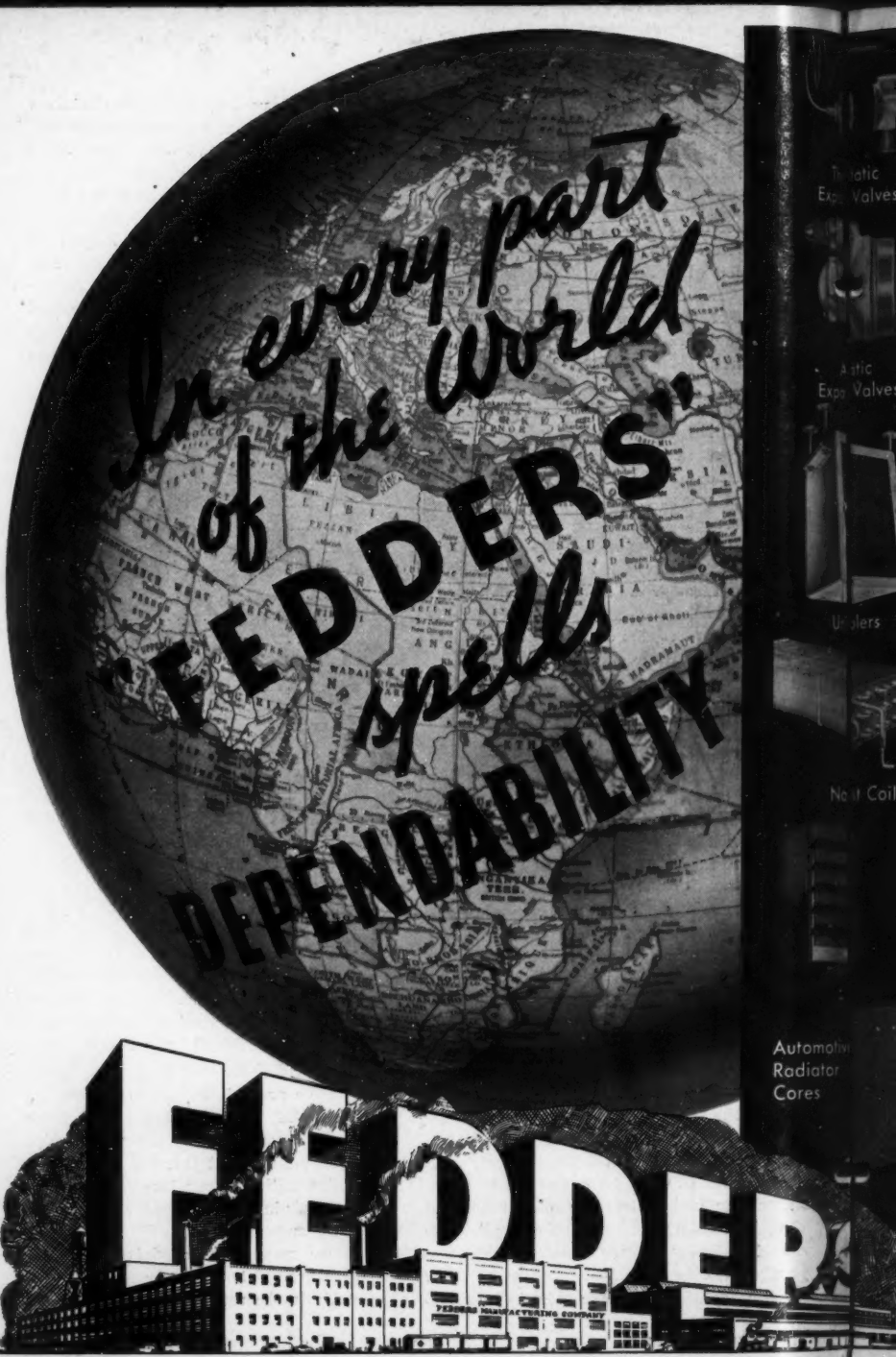
Heat Loss of 6 Foot by 8 Foot by 9 Foot Cooler
Heavy Service—60° T.D.—3 Inch Cork

	B.T.U. Per 24 Hours		
	Insulation	Service	Total
A	36,720	44,600–7,500	88,820
B	.....	.....	70,600
C	49,000	27,000	76,000
D	.....	.....	75,700
E	.....	.....	85,000
F	.....	.....	132,500
G	37,600	44,500	83,100
	Average		87,246

The heat loss listed at Servel was computed by means of a slide rule which Servel distributed among their dealers some time ago. The heat loss listed at Westinghouse was determined by means of a slide rule known as the Westinghouse Simplograph. Where no separation of the insulation and service load is shown, the total load is given as being computed by a single factor. You will observe that the total load varies from 70,600 B.t.u. per day minimum to 132,500 B.t.u. per day maximum. The average of the seven manufacturers' determination of the heat loss is 87,246 B.t.u. per day.

I mentioned above that there is no agreement at the present time as to the method of rating Unit Coolers. One manufacturer gives what is known as a basic rating which signifies that the heat transfer is in direct proportion to the temperature difference between the air in the refrigerator and the refrigerant temperatures.

Another manufacturer advises that one should figure 25° temperature difference between air in the refrigerator and the tem-



This modern nine-acre factory is the birthplace of Fedders Quality Performance. Forty years of heat transfer experience, time-proven satisfaction, fine hydration and rigid inspection—you get the ALL when you standardize on Fedders Refrigerant Products. Take advantage of Fedders' complete for

You Pay Nothing Extra for Fedders Extra Quality

ATLANTA, GA.
Fedders Manufacturing Co.
M. D. Patterson Co.
BALTIMORE, MD.
Melchior, Armstrong, Dessau Co.
BINGHAMTON, N. Y.
Service Supply Co.
BOSTON, MASS.
Fedders Manufacturing Co.
A. E. Borden Co.
Melchior, Armstrong, Dessau Co.
BRIDGEPORT, CONN.
Parsons Bros.
BROOKLINE, MASS.
Refrigeration Supply Co.
BUFFALO, N. Y.
Fedders Manufacturing Co.
Beals, McCarthy & Rogers
Root-Neal & Co.
CHARLOTTE, N. C.
Henry V. Dick & Co.
CHICAGO, ILL.
Fedders Manufacturing Co.
Airo Supply Co.
The Harry Alter Company
H. W. Blythe Co.
Borg-Warner Service Parts Co.
George Monjian
H. Channon Company
CINCINNATI, OHIO
Fedders Manufacturing Co.
Merkel Brothers Co.
CLEVELAND, OHIO
Debes & Company
The Harry Alter Company
COLUMBUS, OHIO
Hughes-Peters Electric Corp.
DALLAS, TEXAS
Fedders Manufacturing Co.
Beckett Electric Co.
DAVENPORT, IOWA
Republic Electric Co.
DAYTON, OHIO
Allied Refrigeration Co.
DENVER, COLO.
Auto Equipment Company
DETROIT, MICH.
W. C. DuComb Company
FERNWOOD, MISS.
Enochs Sales Company
FORT WORTH, TEXAS
McKinley Refrigeration Supply Co.
GREENSBORO, N. C.
Home Appliance Service Co.
HARRISBURG, PA.
Melchior, Armstrong, Dessau Co.
HEMPSTEAD, L. I.
Home Oil Burner Corp.
HOUSTON, TEXAS
Walter Refrigeration Supply Co.
INDIANAPOLIS, IND.
Langsenkamp Company
JAMAICA, L. I.
Home Oil Burner Corporation
KANSAS CITY, MO.
Forslund Pump & Machinery Co.
Natkin & Company
LANCASTER, PA.
M. & E. Refrigeration Accessories Co.
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Allied Refrigeration
LOS ANGELES, CALIF.
Fedders Manufacturing Co.
Franklin G. Slagel Co.
Pacific Metals Co., Ltd.
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Geo. Dehler, Jr. & Co.
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Lowe Electric Co.
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MINNEAPOLIS, MINN.
Refrigeration & Industrial Supply Co.
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Teague Hardware Company
NEWARK, N. J.
T. W. Binder & Company
NEW ORLEANS, LA.
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The Spangler Company, Inc.
NEW YORK CITY
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Refrigerator & Power Specialties Co.
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Refrigeration Supply Company
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Refrigeration Parts Supply Co.
ST. LOUIS, MO.
The Harry Alter Company
Brass and Copper Sa'es Co.
The Spangler Company
R. E. Thompson Co.
ST. PAUL, MINN.
Thermal Service Co., Inc.
SPRINGFIELD, MASS.
C. P. Payson Co.
SYRACUSE, N. Y.
Syracuse Supply Co.
TORONTO, CANADA
Davis Automatic Controls Co.
TUCSON, ARIZ.
Glover & Clark
WASHINGTON, D. C.
Refrigeration Supply Co.
WILKES-BARRE, PA.
Radio Service Co.
VANCOUVER, B. C.
Fleck Bros., Ltd.
WHITE PLAINS, N. Y.
County Seat Plumbing Supply Co., Inc.

FEDDERS MANUFACTURING CO.

57 TONAWANDA ST. BUFFALO, N. Y.

perature of the refrigerant during the running period. For example, if you want 40° box you may operate the unit so that the pressure control shuts off at a pressure corresponding to 40 minus 25 or 15° F. Therefore, the rating of the units must be given for 25° temperature differential. Two other manufacturers (General Electric and Fedders) use 14° F. which signifies the *average temperature difference* between the air in the box and the *average* refrigerant, and they rate the units accordingly. It is important to remember that irrespective as to which manufacturer's unit is selected a Unit Cooler does not refrigerate when the compressor is off; all it does is circulate air in the box if the fan is running during the off portion of the cycle. For this reason the off period of the compressor should be taken into consideration. The average load of the seven manufacturers listed of 87,246 B.t.u. per day should be divided by sixteen in order to obtain the B.t.u. per hour which the Unit Cooler should transfer, if sixteen hours out of twenty-four is selected as the basis of measurement, that is, two-thirds running time of the compressor. In this case the load works out to 5,450 B.t.u. per hour.

Fan Controls

Regarding fan controls, in general the fan motor of Unit Coolers should operate continuously, day after day, month after month, and year after year, never shutting down except when there is an electrical disturbance. This rigid service calls for the use of the highest grade motors obtainable. Many manufacturers advise that these motors should run continuously for best operation, both from a humidity and circulation standpoint. Some manufacturers so arrange a motor switch which shuts off the motor during a portion of the running cycle of the refrigeration compressor. This type of switch is known as a reverse cycle switch, as it cuts-out at high pressure and cuts-in at low pressure, acting just opposite of the pressure control. Service engineers call this switch an "economizer switch," I presume because it is supposed to save electricity.

Other manufacturers furnish motors having three speed controllers, and during cool days the operator turns the switch from high speed to medium speed, or to low speed, in order to cut down the air volume and, incidentally, decrease the capacity of the unit. Many manufacturers insist that the installation service engineer place a switch at the outside of the refrigerator near the door so that they may shut off the fan motor when they enter the refrigerator. Their purpose in doing this is to eliminate any chance for developing a stiff neck when exposed to drafts as they enter the refrigerator to change a keg of beer or to cut off a side of beef. Many others accomplish the same result by placing a button in the door jamb so that when the door is opened the fan motor shuts off.

Study Data

All in all, I have told you very little about Unit Coolers. I shall feel that my efforts will not have been entirely in vain if, whatever unit you are using, you study all of the available literature and instructions which that manufacturer has to offer. As I mentioned above, the manufacturers have not as yet agreed as to how to rate these units, and each manufacturer has his own peculiar characteristics in his line of units and unless you are acquainted with them you may have difficulty with the installation. To get the best results from these units select a line, become acquainted with that line, and stick to that line.

Testing Code Proposed

Last winter at our annual meeting the American Society of Refrigerating Engineers had a code proposed for testing of Unit Coolers and air conditioning units. This code has not as yet been adopted. Even after it is adopted it will take possibly a year before it will be used by the various manufacturers, and published in their literature, and uniformly understood by the various manufacturers, and by the purchasing public. Until such time we must go along, groping in the dark, trying one thing and then another in order to obtain satisfactory results.

The Unit Cooler, in my estimation, is here to stay, and the extent to which it will be used in the future depends upon you Service Engineers. Your experience with these units will have more effect upon their use in the future than anything else I know of.

REFRIGERATION TOOL SERVICE

THE installation and servicing of refrigeration equipment requires specially designed tools, as well as the proper selection of standard wrenches and other small hand tools. The Snap-on refrigeration set illustrated contains a quality built ¼-in. drive, reversible ratchet wrench for work on the valve stems. In addition, there is a 2¼-in. extension bar, adapting 9/32-in. square drive socket wrenches to this ¼-in. ratchet; also, two adaptor plugs, one of which adapts 9/16-in. drive sockets to the ratchets; the other adapts the ⅜-in. square drive socket to this ratchet.

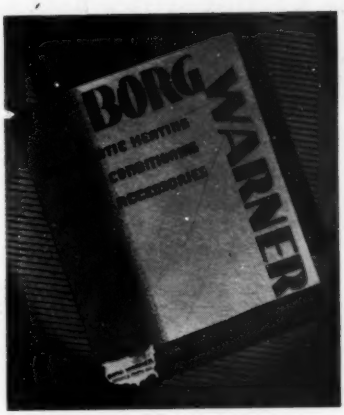
The socket equipment consists of five sizes of square valve stem sockets, from 8/16-in. to ⅜-in., five sizes of packing gland nut sockets, and a special Kerotest valve packing nut socket; also, three sizes of ⅜-in. square drive sockets, 7/16-in., ½-in., and 9/16-in. sizes.

These tools are not to be confused with cheap, case-hardened sockets, but are built of the very finest steel, accurately heat-treated, and fully chrome-plated, and are comparable in strength and quality to the standard Snap-on brand of socket wrench equipment.

S S S

NEW BORG-WARNER CATALOG

THE Borg Warner Service Parts Company, a division of Borg-Warner Corporation, has just issued a new and complete catalog for air conditioning parts and accessories. The catalog also includes parts and accessories for automatic heating units.



In announcing the new catalog, which is said to be one of the most complete catalogs ever issued for parts and accessories in the air conditioning field, Mr. Ray P. Johnson, of Borg-Warner, stated: "We are proud to announce that we are expanding our service parts facilities into the air conditioning field. We feel that air conditioning for both summer and winter goes hand in hand with our policy for handling a complete line of refrigeration parts. Our experience in the last few months with refrigeration service engineers has taught us how interested they are in the air conditioning field. We hope they will appreciate this new service that Borg-Warner offers, and we assure them that we shall continue our policy of wholehearted cooperation."

The Borg Warner Service Parts Company has branches in fourteen of the leading American cities. This company has a world-wide reputation for distributing automotive parts, and the facilities of this great company are continually expanding to aid the engineers in refrigeration and air conditioning.

S S S

R. J. Babcock,
Oklahoma.

"Enclosed please find check for my 1937 subscription. I certainly could not do without the R. S. E. It certainly is the service man's best friend, and I only wish it came out once a week."

The REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

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Official Organ
REFRIGERATION SERVICE ENGINEERS' SOCIETY

"PREVENTIVE MAINTENANCE"

THE editor lays no claim to the origin of the expression "preventive maintenance." It originally titled an article in the August issue of THE REFRIGERATION SERVICE ENGINEER by R. S. Dawson. It is worthy of repetition, particularly at this season of the year. Briefly, it suggests a profitable method of building goodwill by eliminating the necessity of doing a makeshift job during the extreme busy weather when many calls make it so necessary to try to render a satisfactory service to all.

In order to satisfactorily accommodate the demands of customers it is necessary to work out some form of annual service contract, calling for at least monthly inspections. This has been one of the moves that THE REFRIGERATION SERVICE ENGINEER has been interested in. We believe that "preventive maintenance" on commercial equipment is a definite possibility, but we do recognize that it is a sales job.

With the motive to serve the customer in the fullest capacity, and to incidentally cut his repair and upkeep costs on his refrigerating equipment, we confidently believe this should be incentive enough to try to do this sales promotion job.

It certainly is a desirable way of building customer satisfaction. As the author so forcibly brought out in his article, no matter how just the cost of the service may be, the customer always associates the service man with any delay he might experience in the operation of his equipment. Then to pacify the customer with the hope and expectation of saving his goodwill, it is often necessary to make some readjustment on the service charge, thereby resulting in less or complete loss of profit for the job.

"Preventive maintenance" is an old successful practice among many professions. In a nature, it is a form of insurance to guarantee successful operation, and, incidentally, insure longer life for the equipment. It sums itself up in that the service men must do a selling job, selling the customer on maintenance contracts. This is the time of the year to do it, and it can be made a profitable venture.

S S S

A. E. Wyatt,
Canada.

To date I have not received my November copy of the REFRIGERATION SERVICE ENGINEER. I expected it to be a little late because of you covering the R.S.E.S. Convention, but I think it ought to be here by now.

It is such a good thing that I don't want to miss any copies and if I don't get it by the 20th of the month I begin to find out if the mails have been delayed for any reason. In my estimation there is no other publication like it.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.

DATES ESTABLISHED FOR R.S.E.S NATIONAL CONVENTION AT CHICAGO

BY action of the Board of Directors, the dates selected for the 1937 convention, to be held in Chicago, are as follows: Wednesday, Thursday and Friday, November 3, 4 and 5, 1937.

The formal announcement of the selection of the hotel at which the convention will be held will be made in January.

A MESSAGE FROM THE PRESIDENT

ALMOST every day some testimonial letter is received by the publishers of our official organ, the REFRIGERATION SERVICE ENGINEER, telling them of the great help this magazine has been to them.

I have often wondered what these subscribers read in the magazine, and whether it is possible for a man to see notices of meetings and reports of conventions of the Refrigeration Service Engineers' Society without becoming curious as to what this Society really is.

Do these readers ever have any desire to get acquainted with a larger number of men in the same industry, or are they content in just getting their little questions answered in the question box, reading the feature article, and looking over the advertising?

Have they ever experienced the satisfaction of having contributed something toward bettering their end of the industry; from having made friends of their competitors; from having given someone a helping hand at some time or other; from meeting other men from various parts of the country and from the exchange of ideas with them?

Have they ever assembled with other men regularly, regardless of whether they were tired, or possibly it was raining or snowing, and have they ever had it said about them: "There is a man we can always depend on when a job is to be done"?

Has it ever occurred to the subscribers of the R.S.E. that they are missing something by not belonging to the Refrigeration Service Engineers' Society, something which may put extra dollars in their pockets, give them more prestige, make them better known, and make them better men?

This holds true, no matter what your status in the industry is, whether you are a service engineer, a contractor, a jobber, or a salesman.

This organization's objects are educational and I do not believe that any of us know it all. We can always learn something new.

New Address of President

PRESIDENT Paul Jacobsen is now located in Marion, Indiana. President Jacobsen is establishing his own refrigeration service business to service this locality.

Refrigeration is a young industry and whether you live in United States or Canada or any other country in the world, you owe it to yourself to learn all you can about this industry.

Get into the spirit of one of the greatest organizations ever started, particularly for you.

And do it today. We invite your membership.

Yours very truly,

PAUL JACOBSEN, *President.*

NEW CONSTITUTION AND BY-LAWS TO BE DISTRIBUTED

THE amended Constitution and By-Laws, which were passed upon at the convention in Memphis, are now being printed in booklet form and will be mailed to all members.

Among the important changes is that relating to the change in the fiscal year as regards the payment of dues. Under the former Constitution and By-Laws, the fiscal year was for the period from January 1 to December 31 of each year. The new change provides that the fiscal year for dues shall be from July 1 to June 30 of each year.

In order to conform with this new arrangement, the National Society will bill chapter members and members-at-large for the six months' dues for the period of January 1, 1937, to June 30, 1937. On July 1 each member will be billed for the complete year from July 1, 1937, until June 30, 1938, thereby affecting the change in conformity with the Constitution and By-Laws.

Recommend Chapters to Adopt National Society Policy

In order that the individual chapter accounts may conform with those of the National Society, and to avoid any confusion, it is suggested that each chapter adopt the fiscal year as regards dues of July 1 to June 30 of each year. This does not mean that the business year, which has been universally adopted to conform to the calendar year, should be changed. The annual meeting can be held early in January as at present.

R. S. E. S. EXHIBITS AT MEMPHIS CONVENTION

Cutler-Hammer Co., Milwaukee.
Zenith Carburetor Co., Detroit.
Chicago Tubing & Braiding Co., Maywood, Ill.

TRI-CITY AREA APPLIES FOR CHARTER

SERVICE men, comprising the Tri-City area of Davenport, Ia., Rock Island and Moline, Ill., including Iowa City, Ia., and Kewanee and Galesburg, Ill., met at the Hotel Davenport, Davenport, Ia., at a special meeting arranged through the courtesy of Mr. E. L. Bengston, assistant sales manager of the Republic Electric Co., Inc., refrigeration jobbers in Davenport.

Preceding the meeting held for the consideration of forming a chapter, Mr. Austin Jones of the United Refrigerator Supply Co., of Omaha, and manufacturers' representative, gave an interesting talk on the Kerotest line and other products which he handles.

Following Mr. Jones' talk, Mr. E. L. Bengston introduced National Secretary H. T. McDermott, and stated that the purpose of this meeting was in response to a number of inquiries regarding the formation of a chapter in the Tri-City area, and that Mr. McDermott was invited down to outline the purposes and objects of the National organization, and to explain the method of getting a chapter organized. As a consequence, it was voted unanimously to start a local chapter, and temporary officers selected to serve during the formative period of the chapter, included: Temporary President — Harold McChesney, Durant, Ia., Temporary Treasurer—Fred Tindall, Moline, Ill., and Temporary Secretary—E. L. Bengston, Republic Electric Co., Inc., Davenport, Iowa.

Mr. J. S. Kimmel, president of the Republic Electric Co., Inc., was then introduced and outlined the rapid advancement that refrigeration is making, and the value of the Society to those members who will affiliate themselves with it.

It was decided to hold the next meeting, to complete the organization details, at the office of the Republic Electric Co., Inc., on Friday evening, January 8.

EXHIBITS AT R. S. E. S. CONVENTION

Snap-On Tools, Milwaukee.
Peerless Ice Mach. Co., Chicago.
Imperial Brass Mfg. Co., Chicago.

TWIN CITIES CHAPTER RECEIVES CHARTER

ON Tuesday, December 8, Pres. A. E. Johansen called the meeting of Twin Cities Chapter to order for the purpose of receiving their charter from the National Society. The meeting was held in the Y.M. C.A. at Prior and University Aves., in the regular meeting hall.

After disposing of the chapter business, President Johansen introduced National Secretary H. T. McDermott, who outlined the activities of the National Convention, and proceeded with the presentation of the charter to Twin Cities Chapter.

Plans were made for increasing the chapter's strength, and a lively discussion took place as to the best methods to be adopted.

Messrs. F. R. Pond and H. W. Small, who attended the convention, made reports of the interest and the activities of the three-day convention.

CHICAGO CHAPTER

Meeting of November 24, 1936

By WILLIS STAFFORD, *Secretary*
726 Hinman Street, Aurora, Ill.

THE educational feature of the evening was an interesting talk by Mr. Crucius of the Williams Oil-O-Matic Company. Mr. H. D. Wasson of the Chicago office gave a brief history of the company, and then introduced Mr. Crucius. Mr. Crucius told us first about the service problems in their older type machines. Then he explained their present line of equipment. Mr. Crucius was a very interesting speaker and was able to get his story over very well, as he is a service engineer for the Williams Oil-O-Matic Company.

The business session of the meeting was then opened. Minutes of the last meeting were read and approved.

Applications for membership were read. Membership lapel buttons were presented to Mr. Cappels, Mr. Logemann and Mr. Fred Roth for their work in the recent membership campaign.

Reports were heard from the members and delegates who attended the convention at Memphis. Everybody agreed that it was a very well planned and executed meeting, and everybody had a good time.

Mr. McDermott, who was re-elected as National Secretary, told us what the National body is expecting of Chicago Chapter for the 1937 convention. He stated that we should be able to double this year's registrations and exhibitions.

Mr. Paul Jacobsen, who is now our National President, gave a detailed report of the actual proceedings of the convention. He stated that the Society is much stronger now—both financially and in membership—than ever before.

A resolution was adopted by the Society that a Ladies' Auxiliary be formed. Each local chapter is to have their own group and these will make up the National Ladies' Auxiliary.

Mr. Charles Cappels stated that his firm, the Harry Alter Company, will be glad to give whatever assistance they can on the convention. Other members told of similar pledges of numerous manufacturers and jobbers.

As a surprise to most everyone present, Paul Jacobsen tendered his resignation as our Chicago Chapter President. Mr. Jacobsen is moving to Marion, Indiana, where he is going to start a new service business. We will all miss Paul very much and wish him lots of success in his new endeavor. The Board of Directors will act upon his formal resignation at their next meeting.

Mr. Ivar Skipple, 1st Vice-President, then took over the chair as acting-president.

Meeting of December 8, 1936

This meeting was called to order by Acting-President Skipple, at the office of the H. Channon Co.

President Skipple then introduced Mr. Pat Kramer of the H. Channon Company—our host for the evening. Mr. Kramer introduced Mr. F. W. Copeland, president of the Channon Company, and Messrs. Dawes and Decker of the refrigeration sales division of the company.

Mr. Kramer gave a brief outline of the service they are able to render through their vast stock.

President Skipple announced that the annual meeting of the chapter will be held on

Better Play Safe with Cesco HEALTH GUARD FUME KIT

Mask and cartridges for all refrigerants in handy carrying case

A serviceman never knows when fumes may be encountered. Sometimes he finds a bad leak, where a mask is urgently needed at once. This CESCO HEALTHGUARD FUME KIT is light—compact—inexpensive—handy. The mask is adjusted in a jiffy—and should be used in even the mildest concentration of ammonia, sulphur dioxide or methyl chloride. *Write for literature.*

CHICAGO EYE SHIELD CO.
2341 Warren Boulevard
CHICAGO, ILL.

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2 NEW A-P EXPANSION VALVES FOR THE NEW YEAR

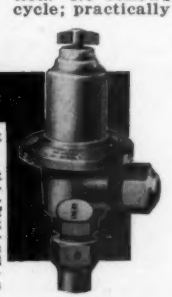
Two new expansion valves complete the popular A-P line which has won such universal preference because of incomparable performance. In addition to the Nos. 210, 215 and 220, there will be the No. 205 Thermostatic Expansion Valve and the No. 206 Automatic Expansion Valve, both available early in the new year.

MODEL 205

Model 205 Thermostatic Expansion Valve

All the advantages of the Model 210, but of smaller capacity —½ to 3-ton Freon. Has smaller bulb, giving quicker action. No piston or pin movement. Minimum friction. Extremely tight and positive shut-off. Not sensitive to rough treatment. Construction of this valve maintains its calibration. No bellows to break; no liquid carry-over on the off-cycle; practically fool-proof, and no service required.

Write for Bulletin RSE 12



MODEL 206

Model 206 Automatic Expansion Valve

Body of forged brass and built with the same precision as characterizes all A-P Valves. Unlike other expansion valves of this type, moisture cannot get inside the hood, due to exclusive type of construction. This eliminates condensation and trouble due to freezing. Designed for ⅛ to 3-ton Freon Capacity.

AUTOMATIC PRODUCTS COMPANY
MILWAUKEE WISCONSIN

January 12th. At that meeting we will adopt some changes in the constitution and also elect officers for 1937.

A letter was read from Pittsburgh Chapter inviting us to their city for the 1938 convention and asking for our support in obtaining it.

Mr. Kramer then introduced Mr. Prebenson of the Carrier Corporation, who gave a very interesting talk on air conditioning. Among the highlights of his talk was a paper written by a layman giving his conception of "All that bunch of machinery in the basement." Mr. Prebenson stated that the three most important service problems are: 1—The customer's whim; 2—The complicated control systems; 3—The proper air distribution. Some more interesting points came to light through the members' questions. The meeting was recessed at this time for a delightful lunch of beer, coffee and sandwiches.

When everyone had about all they cared for, the meeting was again called to order.

An open forum was then held on what should be carried in the tool box. The Channon Company showed us everything from their stock that was called for on the list. This lasted for over an hour and was a very interesting subject.

TWIN CITIES CHAPTER

Meeting of November 10, 1936

By J. SAMWAYS, *Secretary*

3015 Clinton Ave., S., Minneapolis, Minn.

C. A. McCAFFERTY was asked to report on what he had done on codes, and stated nothing has as yet been accomplished but that he thought it would be a good idea to see what the results of the National Convention on codes were before we did anything. Messrs. Schaffer, Palen, Swedberg and Warner were appointed to assist Mr. McCafferty on the Code Committee.

Roll call followed, and each member present was asked to select an absent member's name and get him out for the next meeting.

Mr. McCafferty was thanked for getting his Volunteer Committee together before the last meeting.

President Johansen then discussed our educational program and explained the advantages of being a certificate member. A vote was taken as to whether we should hold certificate membership examinations or just pursue the correspondence course for what we can get out of it. It was decided to hold a certificate examination. Secretary Samways was instructed to write the National Secretary to find out how the examinations are to be given.

President Johansen then discussed various entertainment programs for the winter and suggested that the Entertainment Committee get busy on something.

Mr. Chas. E. Tupper, chairman of the Educational Committee, was then called on to cover the second Lecture Course, which he did in a very nice manner.

Mr. Newton, of the Minneapolis-Honeywell Regulator Company, was then introduced by President Johansen, and gave us some very interesting instructions on controls.

ST. LOUIS CHAPTER

Meeting of November 19, 1936

By E. A. PLESSKOTT, *President*

2145 67th St., St. Louis, Mo.

THIS special meeting of St. Louis Chapter was called for the purpose of giving a complete resumé of the convention activities, and was called to order at 8:30 P. M. by President E. A. Plesskott.

After a complete outline had been given by him, several members who had attended were called upon to give their reaction. The merits of the changes in the Constitution and By-Laws were discussed, as well as the location of next year's convention; also the proposed changes in our local Constitution and By-Laws to make them conform to those of the governing body.

Mr. Petri was appointed to look into the facilities available at the North St. Louis Turner hall with the idea of holding our meetings there next year. He was instructed to report at our meeting of December 10th. Due to Thanksgiving falling on our regular meeting night, the meeting was postponed. It was pointed out that this would also be true of Christmas Eve and it was suggested that this meeting be postponed also.

It was explained that all members who are at this time in arrears for 1936 dues will stand suspended. It was also explained that

due to the change of the fiscal year of the National Organization it may be up to each member to pay an additional six-months' dues, but inasmuch as this merely extended their membership by the same length of time it was fair enough. Since it would also give those who needed the additional time and the summer months in which to accumulate this yearly outlay, it may work out for the best of all concerned.

S S S

RECOLLECTIONS OF THE MEMPHIS CONVENTION

AFTER we arrive home and attempt to complete the service calls that have piled up in our absence, we stop to think now and again of happenings at the convention.

A good time was certainly had by all.

No convention can be like an R.S.E.S. Convention.

Today, the advertising began to arrive, proving that conventions pay for the exhibitor. The Airo Supply letter arrived first. Remember their turtles and whistles?

I hardly think that anyone will forget the air-conditioned dog house by Ansul. That reminds a service man of some of the "jalopies" that some customers own and expect him to keep operating.

The boys were lavishly entertained by the exhibitors—Remember Detroit Lubricator.

Quite a few boys enjoyed their suite immensely, and will remember for a long time that a 678 valve pays 9 to 1. Boy, how those tokens did multiply! "Andy Brown" would have enjoyed those millions.

Waite from Pittsburgh thought that he had acquired that "Southern accent," but after leaving Peabody 1002 for awhile, he lost it again. He wasn't quite sure whether he telegraphed his sympathy or congratulations to his wife on Thursday eve, which was his wedding anniversary.

Several of the boys hoped that the next convention would be held in Honolulu, so they would not be able to go. Why??

Ross, Pittsburgh, discovered very inexpensive night clubs in Memphis.

Fortunately, Wagener's "Horse" did not leave Memphis after the convention. Fortunately *for him!*

It was learned that Pearson of Fort Wayne, Ind., and Wagener of Pittsburgh, in returning home together as far as Indianapolis by car, were obliged to buy three bridges and a boat, besides the "Horse."

The Black and Wright Corp., which operated quite extensively at the Gayoso, handled a good line of products, although a bit expensive.

Ed. Wright probably does not know that the 14 gallons of gasoline in the tank of the V-8 when he started for home was purchased by Dietl, Newark. He says the trip to the cotton gin was worth it, though.

It seems that Thompson's Restaurant will not be recommended, according to Jansen, "Rotary Seals," and Harry Drownes. Well, we were ready to leave, anyhow.

We are looking forward to having a prosperous 1937, so we can all meet again in Chicago.

Humorously yours, N.D.W.

S S S

YOUNGSTOWN CHAPTER

Meeting of December 7, 1936

By **MARTIN BOKESCH, JR.,** *Secretary*
R. F. D. No. 3, Youngstown, Ohio

A MOTION was made and carried that the regular meeting be dropped and a general discussion of the license law be held.

Mr. Ed. Wright read a draft of the license law drawn up by Mr. Boucherle of the City Engineering Department. This draft was thoroughly discussed—pro and con—until it was decided that it was satisfactory to all concerned.

In the general discussion which followed, two visitors in the persons of Mr. Neider and Mr. Lehman of the Ohio-Edison Company took part, assisting the members appreciably by their comments and suggestions. Secretary Bokesch, in behalf of the members of Youngstown Chapter, thanked Messrs. Neider and Lehman for their able assistance in discussing the draft and also for their hearty cooperation with our Chapter.

A motion was carried that the Chapter send Mr. Boucherle a letter advising him that the draft has the approval of Youngstown Chapter.

VIEWS AND REVIEWS

By HERMAN GOLDBERG

NOW that the dust is beginning to settle after our big convention at Memphis, we may ask each other what good we derive from having conventions and trade exhibits or how our businesses in our respective lines can materially benefit from them.

Conventions of all trades and professions have proven themselves a very important and essential part of American industry, as in a sense people engaged in any particular line of endeavor, although competitive in manufacturing or sales, nevertheless really are partners in the development of their general line of activity. It is only through conventions such as held by the Refrigeration Service Engineers' Society that competitors as well as customers covering all angles of activity can really get together and compare notes and products for the betterment not only of their own individual enterprises but also to keep their own particular industry in front of other industries which are materially affected by counter activities.

The goodwill expressed and shown by the people who usually attend conventions has untold value in aiding both the purchasers and the sellers. The purchasers naturally benefit by having a number of suppliers showing their products at the same time under the same roof and are able to have a better picture in their minds as to what they can do with the products and the manufacturers following these meetings. The manufacturers and exhibitors naturally benefit greatly by not only having their own and prospective customers with them in something other than everyday atmosphere but they also gain tremendously through the greatest of advertising mediums; namely, word-by-mouth, or what people say they saw or heard of.

It is also a great enterprise to undertake to conduct a national convention so that all in attendance will be greatly satisfied. This is especially true when the host city is one as large as Chicago because a good deal is expected of a city of this kind due to its large accommodations and facilities. The Chicago Chapter recognizes this and already has outlined definite detailed plans through which the refrigeration convention for 1937 will be a tremendous success.

✕ ✕ ✕

"THE 'CONTRIBS' COLYUM"

By "THE KINGFISH"

MORE impressions from the Memphis convention:

The Memphis Ladies' Committee.

Frigidaire's "cut-away" cabinet exhibit.

E. W. McGovern's ready answers to all questions.

The boys from Ontario Maple Leaf Chapter.

G. D. Wang's talk on truck refrigeration.

Soft-spoken southern girls.

Chas. Eich from Youngstown, Ohio.

Frank Riley and his expansion valves.

The fire next to the Hotel Gayoso.

E. A. Plesskott analyzing the situation.

The cordial representative at the Detroit Lubricator exhibit.

The wives enjoying themselves.

Skinner Chuck Co.'s new idea in piston rings.

Pleasant Geo. Clark.

McLaughlin from Milwaukee and his pipe.

The "Pink" palace.

The large number of jobbers and manufacturers present.

Colyer and Wolverine tubing.

Claude and June Brunton.

Tough looking police on Beale Street.

Excellent demonstration of Copeland products.

The Kellogg "Midget" compressor.

H. V. Higley's charming personality.

The "Chieftain."

The chapter delegates voting.

More Pittsburgh Stogies.

Irving Knudson and Spike Thorndyke looking over the show.

Telephone number 8-2283.

The men from the new "St. Jo" (Mo.) Chapter.

The "Wonder Bar."

New Orleans jumbo shrimps.

The meetings run on schedule.

The new Alco valves.

Snap-On's display of tools which every man would like to have.

The men from San Antonio, New Orleans, Shreveport, La., Tampa, Fla.

McNellis and the Imperial Brass show.

The many ladies present from all cities.

The "strength test" of the rubber in Gilmer belts.

Handy boxes with motor brushes by Superior Carbon Products Co.

The banners in the lobby for next convention city.

The beautiful finish on Perfection Parts.

The hard working Memphis Committee members.

The ever-present R. R. Dunlop from Ranco.

Large binder now necessary for our magazine.

Good looking Curtiss compressors.

Enthusiasm of the newly elected officers.

Automatic Products Co.'s variety of valves.

H. Rieckelman, V. P. of Fedders, telling his boys "how to do it."

CAPITAL CITY CHAPTER

Meeting of October 23, 1936

By ARCHIE T. DEEM, *Silver Springs, Maryland*

A SPECIAL meeting was called to order by President M. H. Hamilton on October 23rd for the formal presentation of the charter of Capital City Chapter.

President Hamilton introduced National Secretary H. T. McDermott, who presented the charter from the National Society and gave a talk on the objects of the Society. Questions were asked by all and Mr. McDermott willingly answered them.

President Hamilton thanked Mr. McDermott in behalf of Capital City Chapter for the charter and his interesting talk, as well as the visitors for responding to our invitation to meet with us, whom he cordially invited to become members.

Meeting of November 6, 1936

At our meeting of November 6 Mr. Charles W. Lund tendered his resignation as secretary and treasurer of Capital City Chapter inasmuch as his work prevents him from attending meetings reguarly, and Mr. Archie T. Deem was elected to serve the balance of this term.

Mr. Sigmund L. Price was voted an Honorary Membership in recognition of the splendid work he has done in organizing the Capital City Chapter.

S S S

"IT'S CHICAGO IN 1937"

By E. S. WRIGHT, *Youngstown, Ohio*

NOW that I am back on the job and have had time to reflect, my analysis of the choice of Chicago for the 1937 convention is that it is the best thing that could have happened for the good of the R.S.E.S.

What happened at that Directors' meeting when they decided to give it to Chicago, I will probably never know. Whether some great providence took a hand, or whether our Board of Directors have the divine gift of foresight, or whether someone is a sleight-of-hand artist makes no difference now.

The way things stand now, as I see it, it's Chicago in 1937 in a big way. I am going to prove it unmistakably in a manner you'll have to take in no uncertain terms, whether you like it or not.

Want *Information*?

Use The R. S. E. SERVICE DEPARTMENT

—It's for Your Convenience

THIS department is conducted for the convenience of our subscribers. We will ask the manufacturers and distributors to send you the latest information on the items checked.

- ☐ Belts
- ☐ Blow Torches
- Blowers (see Unit Blowers)
- ☐ Books
- ☐ Brushes, Motor
- ☐ Bushings, Motor
- ☐ Carbon Tetrachloride
- ☐ Charging Hose
- ☐ Charging Stand
- Coils
  - ☐ Fin
  - ☐ Pipe
- ☐ Compressors
- Condensers
  - ☐ Air Cooled
  - ☐ Water Cooled
- ☐ Condenser Water Regulators
- ☐ Connecting Rods
- Controls
  - ☐ Cold
  - ☐ Humidity
  - ☐ Liquid Level
  - ☐ Pressure
  - ☐ Temperature
  - ☐ Thermostatic
  - ☐ Water
- ☐ Domestic Evaporators
- Dehydrants
  - ☐ Activated Alumina
  - ☐ Calcium Chloride
- ☐ Dehydrators
- Door Seals (see Gaskets)
- ☐ Drums, Service
- ☐ Dryers
- Evaporators
  - ☐ Dry
  - ☐ Flooded
- ☐ Fan and Pulley Assemblies
- Filters (see Strainers)
- ☐ Float, High Side
- ☐ Float Valve Seats
- Fittings
  - ☐ Flared
  - ☐ Streamline
- Gaskets
  - ☐ Compressor
  - ☐ Door
- ☐ Gasket Material
- ☐ Gasket Tackers
- ☐ Goggles
- ☐ Gauges, Service
- ☐ Hardware, Refrigerator
- ☐ Leak Detectors
- ☐ Lapping Compound and Materials
- ☐ Liquid Indicator
- ☐ Lubricating Oils
- ☐ Low Side Float Switches
- ☐ Low water
- ☐ Meters
- ☐ Needles, Float Valve
- ☐ Oil Return
- Packing
  - ☐ Fabric
  - ☐ Metallic
- ☐ Piston Pins
- ☐ Piston Rings
- ☐ Porcelain Refrigerator Cement
- ☐ Pumps, Circulating
- ☐ Receivers
- Recording Instruments
  - ☐ Humidity
  - ☐ Running Time
  - ☐ Temperature
- Refrigerants
  - ☐ Sulphur Dioxide
  - ☐ Methyl Chloride
  - ☐ Carrene
  - ☐ Freon
  - ☐ Iso Butane
  - ☐ Ethyl Chloride
- Refrigerator Dishes
  - ☐ Glass
  - ☐ Porcelain
- ☐ Safety Masks
- ☐ Seals, Shaft
- ☐ Resurfacing Stones
- Strainers
  - ☐ Expansion and Float Valve
  - ☐ Liquid Line
  - ☐ Suction Line
- Switches
  - ☐ Air Temperature
  - ☐ High Pressure Control
  - ☐ Low Pressure Control
  - ☐ Pressure
  - ☐ Temperature
- ☐ Mercury
- Thermostats
  - ☐ Air Temperature (Cooling)
  - ☐ Air Temperature (Heating)
  - ☐ Brine
  - ☐ Domestic Refrigeration
  - ☐ Industrial Refrigeration
- Thermometers
  - ☐ Refrigerator
  - ☐ Test
- ☐ Tool Chests
- Tools
  - ☐ Flaring
  - ☐ Pinchoff
  - ☐ Tube Bender
  - ☐ Tube Cutter
  - ☐ Wrench Sets
- ☐ Trap, Seals
- ☐ Trays, Ice Cube
- Tubing
  - ☐ Copper
  - ☐ Finned
  - ☐ Steel
  - ☐ Tinned
- ☐ Unit Blowers
- Valves
  - ☐ Automatic Expansion
  - ☐ By Pass
  - ☐ Check
  - ☐ Compressor
  - ☐ Expansion
  - ☐ Flapper
  - ☐ Magnetic
  - ☐ Pressure Reducing
  - ☐ Shutoff
  - ☐ Solenoid
  - ☐ Thermostatic Expansion
  - ☐ Two-Temperature
  - ☐ Water
- ☐ Valve Retainers
- ☐ Valve Stems

Write in Names of Products Not Listed

Name .....

Address .....

City and State .....

Business .....

Mail This Page to the

Refrigeration Service Engineer 433 N. Waller Ave., Chicago, Ill.

In another article I am dealing with the subject of chapter cooperation, politics, common sense, and self-preservation, which will further clarify my conclusions.

Chicago must come through big for the sake of the R.S.E.S. as a whole, and they *can't do it alone*. They are going to need help, and plenty of it, because when they took this convention they assumed a big task for themselves. Exhibitors, hotels, railroads, tourist camps and hot spots do not make successful conventions. *Membership attendance does.*

Manufacturers will exhibit in the middle of the Atlantic Ocean if they have to sleep on a raft, eat sandwiches and drink sea water cocktails, provided they know there will be attendance.

Figure it this way: It is not what it costs just to come and go to a convention location to exhibit. That is probably the lowest part of the expense. It is the material and time used in making the exhibit plus the living expenses of from two to six representatives, plus their salaries, which are not small, plus what they provide in the way of entertainment, plus this and that and a couple more.

Divide the total amount by the number of visitors they get at their booth exclusive of the other exhibitors, friends, wives, sweethearts, bellboys, souvenir hunters and idle curious folks, and you get how much it costs them per interview. If there is not the proper membership attendance you would be surprised how much these interviews cost each.

It should be a rule of our Society that every member in attendance should not only visit each booth, but should register at every one on forms provided by us. An exhibitor should not have to give away everything from rejuvenators to camping outfits, to have his products looked at by the members of the organization.

Now don't get me wrong. I did not attend many business sessions; slept very little; imbibed too little; but I did circulate and collected, just like everybody else, until there wasn't any more. I talked and found out that while there were some details in the way of arrangements which were not all to be desired, that the manufacturers were 100

per cent for the R.S.E.S. and thought it was a wise and smart move to hold the convention at Memphis because we are a young and growing bunch and it would increase the membership of the southern states. *Get that word membership,* and if you doubt the truth of this above statement, ask any manufacturer.

Now remember, we have before us the great problem of which George Uetz spoke: the proper licensing and regulation of refrigeration men. We have no quarrel with anyone except the incompetent. We must continually seek to raise the standards of our own members and secure the membership of many who should belong but do not.

This must be done. Let Chicago, to whom we look for guidance, to whom we owe what we have today, who breathed the breath of life into the brain child of Buffalo, nursed it, taught it to creep and walk and grow. Let them delegate someone from each chapter to be responsible for national convention attendance and help obtain exhibitors, then try to work out some plan whereby, together with the financial help of each chapter (especially the eastern ones) sufficient funds will be available to help pay a full-time organizer (someone who is now a member in good standing) to get out and get these new chapters formed and to raise the morale of the weaker ones. If that cannot be done, perhaps a member of the various chapters in certain sections can be reimbursed sufficiently to allow him to take time enough to travel the necessary distance and spend time enough to get things rolling; to go back and address the first meeting and help in the formation of the chapter.

Demand and obtain what we all must give: cooperation and help. Chicago must come through for us all; we all must come through for Chicago.

A Tribute to Southern Hospitality

Pen and ink cannot put on paper what is given to man to see, the mind to understand, and the heart to feel.

Our brother members in Memphis have done something for all of us in the R.S.E.S. which even they cannot fully appreciate nor evaluate.

To have been privileged to meet and break bread with them; to have felt the spirit of the true southern gentlemen and their gracious ladies will always be one of the pearls in our rosary of memories.

To Memphis we say: If our coming has helped you to stand closer together we are glad, for our meeting with you has done likewise for us.

So, until we meet in Chicago in 1937, let's carry on together!

ED. WRIGHT.

ROY COX, A NEWLYWED

CONGRATULATIONS are in order for Pres. Roy Cox of Kansas City Chapter. He has left the ranks of the single boys, and was married shortly after his return from

the Memphis Convention. The event occurred on Monday evening, November 21.

His many friends in the Society will wish Mr. and Mrs. Cox a long and happy married life.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box." The following questions are answered by Mr. George H. Clark.

REPLACING NORGE COMPRESSOR

QUESTION 166. *Would you please outline the proper procedure to be followed in removing and replacing a compressor in a 1936 Norge refrigerator?*

As the compressor is on the high side of the system, I would like to know where the pressure comes from after a vacuum has been pumped on the compressor, with the necessary valves in the system closed. The ordinary procedure followed in changing other compressors, doesn't seem to work on this unit.

ANSWER: In order to remove a Norge compressor from a condensing unit, it will, of course, be necessary to get the gas out of the compressor. You cannot get the gas out of the compressor by drawing a vacuum with it, as the suction line connects directly into the compressor cylinder and the discharge is into the case so that in drawing a vacuum you will only empty the line directly into the compressor itself and the case is still filled with refrigerant at high pressure.

I would suggest that with the gauge connection closed on the discharge side of the compressor, provided this model has one, you put a tube fitting in the gauge opening and connect this to a hand valve, then close both suction service valve and discharge service valve against the condenser connection. This will leave the case open to the tube and auxiliary valve which I mentioned.

With the condenser and suction line shut off to the compressor, purge the gas out of the auxiliary valve which you have installed until the pressure in the case is down to atmospheric pressure, so that you may remove your auxiliary valve and tube and remove the compressor in the usual manner.

If there is no valve on the discharge side of the compressor, the same procedure can be followed except that the auxiliary tube and valve may be connected into the suction service valve gauge connection. The gas can then be purged out the suction side with the compressor stopped. In this way it is necessary that the gas leak by the rollator in order to be purged out this valve; and if a compressor is in good condition, it may be difficult to get all the gas out in this way; but if the compressor is worn or is not working properly, it will probably be quite easy to get all the gas out of the compressor in this way.

If there is no discharge service valve, it will be necessary, of course, to pinch off the tube to the condenser so that the flare nut on the discharge connection may be removed from the compressor.

OIL TRAP

QUESTION 167. *Please tell me how an oil trap works, why, and the reason for its size in comparison to compressor. In other words, engineering data on oil separators. If you cannot give it to me, please tell me where I can get it.*

ANSWER: An oil trap is located in the compressor discharge line between the compressor and the condenser. The oil trap contains a considerable amount of surface in some sort of baffle which the refrigerant vapor and oil impinge against; and the oil collects as a liquid on this surface and drops down into the bottom part of the oil trap shell, while the refrigerant vapor passes out another opening at the top of the trap and to the condenser. The oil which drops to the bottom of the trap will raise a float ball opening a needle valve which allows the oil to be pushed out of the trap and back into the crank case of the compressor. Thus there are three connections on the oil trap.

The inlet of the trap is connected to the compressor discharge service valve, the vapor outlet of the trap is connected to the condenser, and the oil return tube is connected into the crank case of the compressor.

The oil trap should be of sufficient size to collect the oil as fast as it comes through with the refrigerant vapor. I would suggest you follow the manufacturer's recommendations as to the size of oil trap required for a particular job.

One precaution in connection with the use of oil traps consists in wrapping some heat insulating material around an oil trap which is to be used on an air cooled machine, otherwise the oil trap may be cooled by the air and some of the refrigerant may be condensed in the trap and be returned to the crank case through the oil float valve which would cause refrigeration between the oil trap and compressor, and possibly in the crank case of the compressor. In other words, the oil trap should be maintained at a temperature higher than the condensing temperature. With water cooled machines the condensing temperature is normally low enough so that insulation around the oil trap would not be required.

CONDENSATION ON MEAT

QUESTION 168. *We have an ammonia refrigeration plant at a meat storage and sales plant that handles carload shipments of beef. The machine is a ten horse power Baker.*

During the summer, the machine kept the meat in good condition and the company was well satisfied with the operation, but since the weather has cooled off, the machine only runs once or twice a day, and the coils are completely defrosted between cycles.

The operators are complaining that the meat is getting wet and sticky. I blame it onto the cooler weather not requiring sufficient refrigeration to absorb the moisture through frost collecting on the coils; consequently the moisture is not evaporated from the meat.

Can you give us any information as to any method of drying out the meats when refrigeration is not needed?

Can you give us the name of some firm from whom we may buy capillary tubing? No one here seems to know of such a thing.

ANSWER: The difficulty which you describe undoubtedly is due to the fact that the air circulation in the refrigerator is decreased when the operating time of the refrigerating machine is cut down during the cooler weather. My suggestion would be to put in some sort of blower in the cooler which would continually circulate the air whether or not the refrigerating machine is operating. This will eliminate the sticky condition of your meat and also tend to eliminate the possibility of beads of moisture forming on the ceiling and walls of the refrigerator itself. The blower circulating air over your coils would also add to the capacity of your coils when the machine is refrigerating.

I presume you have a temperature control in this cooler which is, of course, the best method of controlling temperatures in a job of this kind.

I believe any manufacturer of tubing can furnish tubing of almost any size that may be required for capillary tubes or anything of that nature. If your local supplier cannot take care of you on this, I would suggest that you write to the manufacturer direct and I am sure they can take care of you.

WATER-COOLED ELECTROLUX

QUESTION 169. *Have a Model EL—73475 water-cooled Electrolux using natural gas, and which does not cool. Have tested for the burner and water valve and both seem to be working perfectly, but after having the burner on for 30 to 45 minutes, cannot get any cold in the box and the tube for the gas leading into the box gets quite warm. Is there such a thing that it has lost its charge? But, even with the gas burning this long, cannot find any place where it is leaking.*

Is there such a thing that at sometime it has had an excessive heat by the water being turned off and the safety fuse plug opened, and let all the charge out? But even now, it does not show any leak there.

What is the proper way to recharge the unit, and amount of ammonia and water to use?

ANSWER: It may be possible that your difficulty with the water cooled Electrolux may have something to do with the adjustment of your gas burner. If the flame is too large

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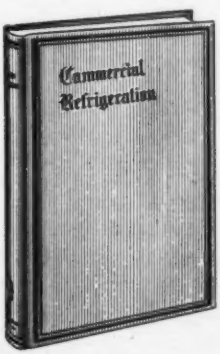

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and too much heat is furnished, it will cut down on the amount of refrigeration; and if the flame is too small, the amount of refrigeration furnished will be decreased. The flow of water should be regulated so as to maintain the proper outlet temperature, which should be about luke warm.

The machine, of course, may have lost its charge; but I believe that cases of this kind are quite rare. It is quite possible that for some reason or other, the various liquids and gases in the machine may have gotten into the wrong part of the system and without giving any explanation of what has happened, I do know of one case where an Electrolux machine operated as you described and the service men simply took everything out of the refrigerator, turned it directly upside down, let it stand on its top for a period of several minutes, then turned it right side up again, reconnected gas and water and put the machine back in operation; and strange as it seems, it worked perfectly ever since.

MAKING MERCURY GAUGE

QUESTION 170. *Will you please give me complete data such as: length and size of tube, quantity of mercury, and how to mark scale when making a mercury gauge to measure vacuum?*

Assuming a display case is to have two evaporating coils installed in it with one in each end, does it matter whether or not each coil has an independent valve, or just one valve and the coils connected in series, provided that the pressure drop of the two coils in series is not too great?

ANSWER: In order to make a U tube gauge, obtain a piece of glass tubing preferably about 6 feet long, and by heating the glass, you may bend this into the form of a U. It will be necessary to have both legs of the U at least 30 inches long. If it is longer than this it will eliminate some of the possibilities of blowing over the mercury occasionally. The glass tube preferably should be of approximately ¼ inch bore. The size you actually use will probably depend on just what size you can get.

If you obtain tubing of ¼ inch bore, 1 lb. of mercury should be sufficient for approximately 40 inches of the ¼ inch diameter tube. If you use a larger bore, it may be necessary to use more mercury. The diameter of the tube, of course, has nothing to do with the actual measure of pressure. It simply means that a large tube will require more mercury to fill and, of course, if a tube were extremely small in bore, there would tend to be a reverse capillary action in the tube, or the mercury would not move freely in the tube.

A yard stick or any measuring stick marked off in inches will be suitable for measuring your difference in mercury level. If you mark a zero point on your gauge at the point where the two levels are the same when there is no pressure or vacuum on either side of the tube, then you could mark divisions up on the length of the tube which you are to connect to your vacuum. This scale might be calibrated in inches and half inches. Each half inch on this one leg of the tube would indicate 1 inch of mercury vacuum, since when the mercury rises one-half inch in that leg of the tube, it also drops one-half inch in the other leg of the tube so that the difference in level is 1 inch, indicating a 1 inch vacuum. If you have a tube which extends 15 inches above and below this zero point, you can be sure that you will be able to measure any vacuum you can produce.

One valve should be sufficient for two coils in a display case connected in series. The only reason for using two valves would be in a case where the drop in pressure through the two coils in series would be excessive or where the coils were so large that one valve might not furnish sufficient refrigerant, which would be indeed an extreme case in a display case.

AMMONIA VS. METHYL CHLORIDE

QUESTION 171. *The back copies and the current issue of the* REFRIGERATION SERVICE ENGINEER *have been received, and although I have not had time to read them all yet, I am well pleased with what I have read. It is really better than I expected.*

Well, I'm a new member of the family, so to speak, and I'm going to step right up and expose some of my ignorance by asking questions. You know, I am one of those "Old Timers" who think a lot of ammonia, and

never thought much or nor had much to do with this "Small Stuff" until this summer I just couldn't get out of doing a few jobs, and am already beginning to think a little better of the "Little Fellows."

I have one, a new 1½-hp. methyl chloride job which gave quite a bit of bother, and still I think I am about right on it. Here is the deal. An old customer of mine bought a 1½-hp. Crano air-cooled machine, recommended for his particular job by those from whom he bought it. I didn't sell it, because I couldn't give him the terms he required. I installed the job for him and it operated perfectly until in July when the weather began to get HOT (I mean 115 and 117 in the shade) and the machine didn't stop running for a few days. Well, he got a notion he was short of gas and called me in. I put a gauge on and found the head pressure to be nearly 200 pounds and told him it was just too hot, as it looked to me. He still insisted that he needed gas so I got some and put in a little over a pound, and the thing went crazy. So I purged it down again to where it was. Before I put this gas in, the condenser and receiver were so hot, we couldn't lay our hands on them, as was the liquid line clear to the expansion valve. Well, he got some ice and cooled the receiver down so it wouldn't burn the fingers, and started the machine up and it ran perfectly for about half an hour by which time it was all hot again and it quit cooling and just ran on.

He still insisted on more gas, so I told him he would have to get someone else to put it in as I wouldn't do it. Well, he called a hot shot from a neighboring town about 35 miles away, and he put six pounds of methyl chloride in the system, and it did start to freeze. He said there must have been a leak, and it was just short of gas. He borrowed my leak detector, but couldn't find any leak, even at the high pressure it then had. He didn't use a gauge so no one knows just how much pressure there was, but in about three days, a head gasket blew out, and they had quite a time. They called me, but I was out of town and couldn't come, so they got this other fellow to fix it up for them, and I've heard nothing more of it, but last month they used 393 KW of electricity with this 1½-hp. automatic, and right across the street, a 3-hp. hand controlled ammonia job with almost the identical load used 227 KW. So, I am still inclined to think that when it comes to producing cold, ammonia has what it takes.

I would like to hear whatever comment you may have to make pertaining to this deal. I don't understand the difference in the power bill. Had it been reversed, it would look much better.

ANSWER: The particular comment I would make on the particular problem you had is that your methyl chloride machine had a very inadequate air cooled condenser and it is possible also that with the extremely hot weather the machine may require slightly more refrigerant to operate properly than would be required during the cooler weather. I would say that the additional pound of refrigerant which you added at one time would be sufficient to take care of the extreme hot weather condition. The fact that the methyl chloride machine used the large amount of power in comparison with the larger ammonia machine is doubtless due to the fact that the ammonia machine was probably water cooled while the methyl chloride machine was air cooled and probably a poor job at that. If I were to make a recommendation on this job, I would recommend that you use a water cooled condenser on the methyl chloride machine, and I am sure that you will cut your cost of operation down enough so that a few months' use will justify the expense of the water cooled condenser.

S S S

A. R. McCandlish,
Michigan.

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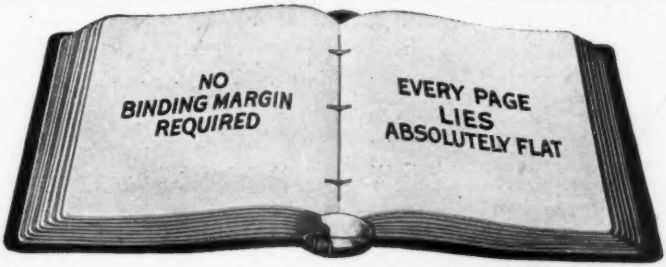

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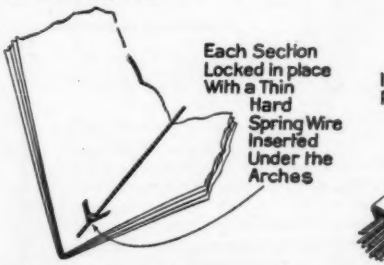

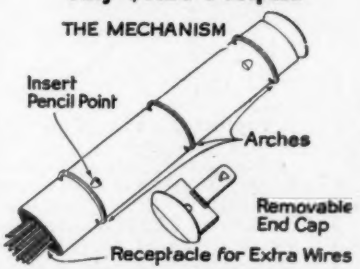

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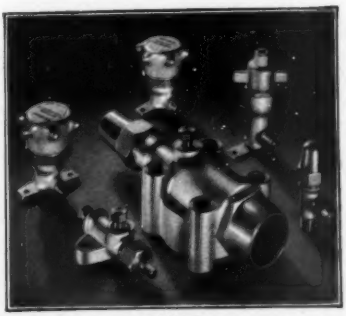

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